MONITORING OF MARINE MAMMALS IN HONG KONG WATERS (2016-17)

FINAL REPORT
(1 April 2016 to 31 March 2017)

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EXECUTIVE SUMMARY

A longitudinal study on Chinese White Dolphins and Indo-Pacific finless porpoises has been conducted in Hong Kong since 1995. The present monitoring study represents a continuation of this long-term research study with the funding support from the Agriculture, Fisheries and Conservation Department of the Hong Kong SAR Government, covering the period of April 2016 to March 2017.

During the one-year study period, 178 line-transect vessel surveys with 5,662.5 km of survey effort were conducted among ten survey areas in Hong Kong. In total, 199 groups of 638 Chinese White Dolphins and 150 groups of 403 finless porpoises were sighted during vessel and helicopter surveys. In 2016-17, the dolphins were frequently sighted to the west and southwest of Lantau Island, but to only a smaller extent in NWL waters, where their occurrence was restricted to the waters around Lung Kwu Chau. After a strong surge of dolphin usage in SWL in 2014-15, their occurrence has apparently diminished in the same area in 2016. Finless porpoises were mostly sighted to the south of Soko Islands and Cheung Chau, and around Shek Kwu Chau in 2016-17. They have also been frequently and consistently found between the waters of Soko Islands and Shek Kwu Chau as well as to the south of Cheung Chau in the past four years.

In 2016, important dolphin habitats are mostly located along the coastal waters of West Lantau, stretching from Tai O Peninsula, Kai Kung Shan, Peaked Hill to Fan Lau. In the past six years, dolphin habitat use patterns were mostly consistent in WL, but their usage there has slightly diminished in 2016. In SWL waters, dolphin usage was higher and more evenly spread in 2014-16 than in earlier years. In North Lantau region, dolphin occurrence has greatly diminished in recent years, and was largely confined to the area around Lung Kwu Chau in 2016. Examination of six key dolphin habitats also revealed that there were continuous declines in usage within the Sha Chau and Lung Kwu Chau Marine Park as well as the Brothers Marine Park in recent years. For finless porpoises, their important habitats during 2007-16 were located to the south of Tai A Chau, west and southwest of Shek Kwu Chau, south of Cheung Chau, and at the offshore waters between Shek Kwu Chau and the Soko Islands during the dry season. On the contrary, porpoise densities were higher around the Po Toi Islands, and at the juncture of Po Toi and Ninepins survey areas during the wet season.

In 2016, the combined estimate of dolphin abundance in Hong Kong waters in

the four survey areas comprising SWL, WL, NWL and NEL was 47 (the estimates for the last five years, i.e. 2011 to 2015, were 88, 80, 73, 87, and 65 respectively). Significant declines in dolphin abundances were detected in each of the three survey areas in NEL, NWL and WL, as well as the combined abundance from the four main areas of dolphin occurrences in NEL, NWL, WL and SWL. Even though a significant trend was not detected in SWL, there was a decline in dolphin numbers in 2016 after a prominent increase in 2014 and 2015. The trend of dolphin abundance in SWL should be closely monitored as this area has been identified as of increasing importance to dolphins in recent years.

The mean group size of dolphins as well as the percentage of feeding activities among all dolphin sightings in 2016 was the lowest since 2002, and it is uncertain whether this is related to any anthropogenic disturbance or a response to changes in prey distribution and resources in western waters of Hong Kong. The percentage of young dolphin calves was on the decline since 2002 and reached the lowest in 2016. The paucity of their sightings and their continuous decline in numbers in the past 15 years could mean a very low level of recruitment for the local dolphin population and is a serious matter of grave concern.

In 2016-17, 150 individual dolphins with 352 re-sightings were identified, with most of these made in West Lantau waters. A number of year-round residents that were frequently sighted in Hong Kong waters in the past have disappeared or only occurred occasionally during the present study period. Changes in the utilization pattern of dolphins in Hong Kong waters, detected in the last monitoring report, were noted again upon analysis of range use of individual dolphins. Out of the 59 individuals from the northern social cluster, more than two-thirds of them have utilized Lantau waters progressively less since 2011, and 35 of them (59%) had started to utilize WL waters more, with 13 individuals even starting to utilize SWL waters more in 2015-16. Notably, such range shifts from North Lantau to West Lantau region in recent years have been reversed in 2016 for five individuals. For the southern social cluster, more than half of the 55 individuals examined have utilized SWL waters progressively more in recent years, and 14 individuals had actually shown clear range shifts from WL to SWL waters in the past two years.

Evidently, the changes in dolphins' distribution, habitat use, abundance and individual range use in recent years are the consequences stemmed from the combination of existing threats and additional threats from coastal development. To address these issues, there should be a more stringent control on reclamation around

Lantau waters, a proper management of high speed ferries, and the establishment of a large marine protected area connecting the Sha Chau and Lung Kwu Chau Marine Park with the proposed Southwest Lantau Marine Park and the Soko Islands Marine Park, subject to further study.

行政摘要 (中文翻譯)

自 1995 年開始，一項有關本地中華白海豚及印度太平洋江豚的長期研究經已展開。此項為期一年 (由 2016 年 4 月至 2017 年 3 月)、獲香港特別行政區政府漁農自然護理署資助的研究工作，正是這長期監察的延伸。

在十二個月研究期間，研究員共進行了 178 次樣條線船上調查，在全港十個調查區共航行了 5,662.5 公里，並觀察到共 199 群中華白海豚 (總數達 638 隻) 及 150 群江豚 (總數達 403 隻)。在 2016-17 年間，中華白海豚經常在大嶼山西面及西南面水域出沒，但卻甚少在大嶼山北面水域活動，並只集中在龍鼓洲一帶水域出現。雖然海豚在 2014 及 2015 年間不斷增加使用大嶼山西南面水域活動，但牠們卻在 2016 年減少在該處水域出沒。另一方面，在 2015-16 年間江豚主要出沒於索罟群島以南及石鼓洲以南水域；在過去四年間，石鼓洲與索罟群島之間一帶水域、長洲以南水域均是江豚恆常使用的生境。

中華白海豚在 2016 年的重要棲身地，主要集中在大嶼山西面整片水域，包括由大澳半島、雞公山、雞翼角伸延至分流一帶水域。在過去六年，海豚在大嶼山西面水域的棲息地運用最為穩定，但其使用量在 2016 年已出現輕微減少跡象；在 2014-16 年間，海豚在大嶼山西南面水域的使用情況較早年明顯增加及較為平均。在北大嶼山水域，海豚於近年的使用率大幅下降，並於 2016 年只集中使用龍鼓洲一帶水域。在六個主要海豚生境中，沙洲及龍鼓洲海岸公園、大小磨刀洲海岸公園的海豚使用率於近年均呈現持續下降的趨勢，情況令人擔憂。此外，在 2007-16 年期間，在枯水期被確認為重要的江豚生境包括大鴉洲以南、石鼓洲西面及西南面、長洲以南、及大鴉洲與石鼓洲之間一帶離岸水域；另一方面，江豚在豐水期間使用量較高的生境，則集中在蒲台群島一帶、及蒲台與果洲兩個調查區域交界之水域。

在 2016 年，中華白海豚在大嶼山西南、西、西北及東北四個調查區域的整體數目估計為 47 隻（2011 至 15 年的數目分別為 88、80、73、87 及 65 隻）。大嶼山東北、西北及西面的調查區域的海豚數量均各自錄得明顯下降趨勢，而四個調查區域合共的整體海豚數目，亦錄得明顯下降趨勢。雖則西南大嶼山的海豚數目並未呈明顯下降趨勢，但自 2014 及 2015 年數目大幅上升後，2016 年的海豚數目卻減少至較低水平。由於大嶼山西南面水域近年已成為海豚一個日益重要的生境，該水域的海豚數量和趨勢需要密切留意。

中華白海豚在香港的平均群體數目、及覓食活動佔整體海豚目擊次數的比率，均在 2016 年創下自 2002 年以來的新低，但此情況未知是否與人為活動造成的干擾、或與海豚的食糧分佈與資源改變相關。幼豚的整體比率亦在 2016 年跌

至自 2002 年以來最低水平，牠們在去年的罕有出現，並在過去十五年出現的比率持續下降，均顯示海豚出生率處於極低水平，此嚴峻的情況令人憂慮。

研究員於 2016-17 年間辨認出 150 隻個別海豚、共 352 次的目擊紀錄，其中大部分均出現在大嶼山西面水域；過去一些經常出沒於香港水域的海豚個體，卻於近年不見所蹤，或只有零星的出沒紀錄。在上一個監察報告中發現的本港水域內的海豚使用模式有所改變，亦再次透過分析個別海豚活動範圍而顯示出來。59 隻屬北大嶼山社群的海豚當中，三分之二的個體自 2011 年起逐漸減少使用該水域，35 隻(佔整體約六成)正增加使用大嶼山西面水域，13 隻甚至於 2015-16 年開始增加使用大嶼山西南面水域。同時，55 隻屬南面社群的海豚中，近年超過一半的個體已逐漸增加使用大嶼山西南面水域，在過去兩年更有 14 隻海豚已明顯地由大嶼山西面轉移到大嶼山西南面水域活動。

各項證據顯示，在香港生活的中華白海豚，無論在其分佈、棲息地使用、數量及個體活動範圍使用於近年所呈現的種種變化，均與牠們每天面對的一些長久存在的威脅、及近期一些與沿岸發展有關的額外威脅有密切的關係。為應對這些威脅，有關部門應更嚴謹地管制在大嶼山水域的填海工程；妥善管理高速船隻的交通量；並視乎進一步研究的結論，在大嶼山西面水域設立一大型海洋保育區，將現有的沙洲及龍鼓洲海岸公園、擬建中的西南大嶼山海岸公園及索罟群島海岸公園連接起來。

1. INTRODUCTION

A longitudinal study on Chinese White Dolphins (also known as the Indo-Pacific humpback dolphin, *Sousa chinensis*) and Indo-Pacific finless porpoises (*Neophocaena phocaenoides*) in Hong Kong and the Pearl River Delta region has been conducted continuously by Hong Kong Cetacean Research Project (HKCRP) since 1995. Such marine mammal monitoring study has been primarily funded by the Agriculture, Fisheries and Conservation Department (AFCD), as well as various government departments, consultancy projects and local environmental NGOs. The multi-disciplinary research study aims to provide critical scientific information to the Hong Kong SAR Government to formulate sound management and conservation strategies for the local populations of dolphins and porpoises (Hung 2015, 2016). Results from this integrated study have also been used to establish several systematic databases, which has been utilized to estimate population size, to monitor trends in abundance, distribution, habitat use and behaviour over time, and to keep track of levels and changes in mortality rates of local dolphins and porpoises (e.g. Hung 2008, 2015, 2016; Jefferson et al. 2002, 2006, 2009, 2012).

The present monitoring project represents a continuation and extension of this research study, with funding support from AFCD of the HKSAR Government. The main goal of this one-year study is to collect systematic data for assessment of the distribution and abundance of Chinese White Dolphins and Indo-Pacific finless porpoises in Hong Kong, to take photographic records of individual dolphins, and to analyze the monitoring data for better understanding of the various aspects of local dolphin and porpoise populations. The one-year project covers the period of 1 April 2016 to 31 March 2017, and this final report is submitted to AFCD for a summary on the latest status of this monitoring project covering the entire one-year study period.

2. OBJECTIVES OF PRESENT STUDY

The main goal of this one-year monitoring study is to collect systematic monitoring data for detail assessment of distribution, abundance and habitat use of Chinese White Dolphins and Indo-Pacific finless porpoises in Hong Kong, to take photographic records of individual dolphins, and to analyze the monitoring data for better understanding of various aspects of local dolphins and porpoises. To achieve this main goal, several specific objectives are set for the present study.

The first one is to assess the spatial and temporal patterns of distribution, abundance and habitat use of Chinese White Dolphins and Indo-Pacific finless porpoises in Hong Kong in detail. This objective was achieved through data collection on dolphins and porpoises by conducting regular systematic line-transect vessel surveys and helicopter surveys. The second objective is to identify individual Chinese White Dolphins by their natural markings using photo-identification technique. This objective was achieved by taking high-quality photographic records of Chinese White Dolphins for photo-identification analysis. Photographs of re-sighted and newly identified individuals were compiled and added to the current photo-ID catalogue, with associated descriptions for each newly identified individual. Photographic records of finless porpoises were also taken during vessel and helicopter surveys for educational purposes.

The third objective is to analyze the monitoring data for better understanding of the various aspects of local dolphin and porpoise populations. This objective was achieved by conducting various data analyses, including line-transect analysis, encounter rate analysis, distribution analysis, behavioural analysis and quantitative grid analysis to assess the spatial and temporal patterns of abundance, distribution and habitat use and trends of occurrence of Chinese White Dolphins and finless porpoises using vessel survey data. The fourth objective is to conduct ranging pattern analysis and residency pattern analysis to study individual core area, ranging pattern, habitat use and movement pattern based on the data obtained from both the line-transect vessel survey and the associated photo-identification work.

The final objective is to educate the members of the public on local dolphins and porpoises, by disseminating the study findings from the long-term monitoring research programme. This objective was achieved by providing public seminars through the arrangement of AFCD.

3. RESEARCH TASKS

During the study period, several tasks were completed to satisfy the objectives set for the present marine mammal monitoring study. These tasks were:

- to collect monitoring data for assessment on spatial and temporal patterns of distribution, abundance and habitat use of local dolphins and porpoises through systematic line-transect vessel surveys and helicopter surveys;

- to analyze line-transect survey data for assessment on spatial and temporal patterns of distribution, abundance, habitat use and trends of occurrence of dolphins and porpoises in Hong Kong;

- to take photographic records of Chinese White Dolphins for photo-identification analysis and update the photo-identification catalogue;

- to analyze photo-identification data of individual Chinese White Dolphins to assess their ranging patterns, core area use and movement patterns;

- to take photographic records of finless porpoises; and

- to assist AFCD in arousing public awareness on local dolphins and porpoises through school seminars.

4. METHODOLOGY

4.1. Vessel Survey

The survey team used standard line-transect methods (Buckland et al. 2001) to conduct regular vessel surveys, and followed the same technique of data collection that has been adopted in the past 19 years of marine mammal monitoring surveys in Hong Kong developed by HKCRP (Hung 2005, 2016; Jefferson 2000a, b; Jefferson et al. 2002). The territorial waters of Hong Kong Special Administrative Region are divided into twelve different survey areas, and line-transect surveys were conducted among ten survey areas (i.e. Northwest (NWL), Northeast (NEL), West (WL), Southwest (SWL) and Southeast Lantau (SEL), Deep Bay (DB), Lamma (LM), Po Toi (PT), Ninepins (NP) and Sai Kung (SK)) (Figure 1).

For each vessel survey, a 15-m inboard vessel with an open upper deck (about 4.5 m above water surface) was used to make observations from the flying bridge area. Two experienced observers (a data recorder and a primary observer) made up the on-effort survey team, and the survey vessel transited different transect lines at a constant speed of 13-15 km per hour. The data recorder searched with unaided eyes and filled out the datasheets, while the primary observer searched for dolphins and porpoises continuously through 7 x 50 *Fujinon* or *Steiner* marine binoculars. Both observers searched the sea ahead of the vessel, between 270^{o} and 90^{o} (in relation to the bow, which is defined as 0^{o}). One to two additional experienced observers were available on board to work in shift (i.e. rotate every 30 minutes) in order to minimize fatigue of the survey team members. All observers were experienced in small cetacean survey techniques and identifying local cetacean species. Beforehand they had participated in rigorous at-sea training program provided by the principal investigator.

During on-effort survey periods, the survey team recorded effort data including time, position (latitude and longitude), weather conditions (Beaufort sea state and visibility), and distance traveled in each series (a continuous period of search effort) with the assistance of a handheld GPS (e.g. *Garmin eTrex 10*). When dolphins or porpoises were sighted, the survey team would end the survey effort, and immediately record the initial sighting distance and angle of the dolphin/porpoise group from the survey vessel, as well as the sighting time and position. Then the research vessel was diverted from its course to approach the animals for species identification, group size estimation, assessment of group composition, and behavioural observations. The perpendicular distance (PSD) of the dolphin/porpoise group to the transect line was later calculated from the initial sighting distance and angle.

The line-transect data collected during the present study were compatible with the long-term databases maintained by HKCRP in a way that it can be analyzed by established computer programmes (e.g. all recent versions of DISTANCE programme including version 6.0, ArcView© GIS programme) for examination of population status including trends in abundance, distribution and habitat use of Chinese White Dolphins and finless porpoises in Hong Kong waters.

4.2. Helicopter Survey

Several helicopter surveys arranged by the Government Flying Service (GFS) through AFCD were conducted during the study period to survey mainly the remote areas that were relatively inaccessible by boat (e.g. Sai Kung, Mirs Bay) (Figure 2). The survey coverage of each helicopter survey largely depended on weather conditions such as visibility, sea state, cloud cover and wind direction, and the planned flight route could be changed with some flexibility according to the final decision by the GFS pilot.

The helicopter survey usually lasted 1.5 hours, flying at an altitude of about 150 m and a speed of 150-200 km/hr. Two to three observers were on board to search for dolphins and porpoises on both sides of the helicopter. Data on sighting position, environmental conditions, group size and behaviour of the dolphins or porpoises were recorded when they were sighted. The off-effort helicopter surveys were mainly used to collect data for distribution of Chinese White Dolphins and finless porpoises, but individual dolphins with very distinct identifying features were occasionally identified from pictures taken from the helicopter.

4.3. Photo-identification Work

When a group of Chinese White Dolphins were sighted during the line-transect vessel survey, the survey team would end effort and approach the group slowly from the side and behind to take photographs of them. Every attempt was made to photograph each dolphin in the group, and even photograph both sides of the dolphins, since the colouration and markings on both sides may not be symmetrical. One to two professional digital cameras (e.g. *Canon* EOS 7D Mark II model), each equipped with long telephoto lenses (100-400 mm zoom), were available on board for researchers to take sharp, close-up photographs of dolphins as they surfaced. The images were shot at the highest available resolution and stored on Compact Flash memory cards for downloading onto a computer.

All digital images taken in the field were first examined, and those containing potentially identifiable individuals were sorted out. These photographs would then be examined in greater details, and were carefully compared to over 900 identified dolphins in the PRE Chinese White Dolphin photo-identification catalogue curated by HKCRP. Chinese White Dolphins can be identified by their natural markings, such as nicks, cuts, scars and deformities on their dorsal fin and body, and their unique spotting patterns were also used as secondary identifying features (Jefferson 2000a; Jefferson and Leatherwood 1997). All photographs of each individual were then compiled and arranged in chronological order, with data including the date and location first identified (initial sighting), re-sightings, associated dolphins, distinctive features, and age classes entered into a computer database. Any new individuals were given a new identification number, and their data were also added to the catalogue, along with text descriptions including age class, gender, any nickname or unique markings. The updated photo-identification catalogue incorporated all new photographs of individual dolphins taken during the present study.

4.4. Shore-based Theodolite Tracking Work

During the present study period, the feasibility study on theodolite tracking of Indo-Pacific finless porpoises continued at the Shek Kwu Chau tracking station, as an extension from the two previous monitoring periods (see Hung 2015, 2016). On each survey day, observers searched systematically throughout the study area for finless porpoises using the unaided eye and 7 x 50 handheld binoculars. A theodolite tracking session was initiated when an individual or group of porpoises was located, and focal follow methods were adopted to track the porpoise movement. Within a group, a focal individual was selected for the purposes of tracking the behaviour and movement of the group, based on its distinctive feature such as colouration or severe injury mark. The focal individual was then tracked continuously via the theodolite, with positions recorded whenever the porpoise surfaced. If an individual could not be positively distinguished from other members, the group would be tracked by recording positions based on a central point within the group when the porpoises surfaced.

Tracking would continue until animals were lost from view, moved beyond the range of reliable visibility (>5 km), or when environmental conditions obstructed visibility (e.g. intense haze, high sea state, or sunset). Behavioural state data were also recorded every 5 minutes for the focal individual or group. This interval was long enough to allow for determination of the behavioural state, and short enough to capture behavioural responses to nearby activities (e.g. transiting vessels). Moreover, when multiple groups or individuals were present in the study area, attempts would be made to record the behaviours of all groups or individuals every 10 minutes, with spotters assisting in determining behaviour of the porpoises.

Positions of porpoises and boat activities were measured using a Sokkisha DT5 digital theodolite with ± 5-sec precision and 30-power magnification connected to a laptop computer running the program *Pythagoras* Version 1.2 (Gailey and Ortega-Ortiz 2002). This program calculates a real-time conversion of horizontal and vertical angles collected by the theodolite into geographic positions of latitude and longitude each time a fix is initiated. *Pythagoras* also displays positions, movements, and distances in real-time. When possible, the position of the focal porpoise was recorded at every surfacing with use of *Pythagoras*. The position, type, and activity of all vessels within 5 km of the focal individual were also recorded. An effort was made to obtain at least several positions for each vessel, and additional positions were acquired when vessels changed course or speed.

4.5. Data Analyses

4.5.1. Distribution pattern analysis

The line-transect survey data was integrated with a Geographic Information System (GIS) to visualize and interpret different spatial and temporal patterns of dolphin and porpoise distribution using their sighting positions collected from vessel and helicopter surveys. Location data of dolphin and porpoise groups were plotted on map layers of Hong Kong using a desktop GIS (ArcView© 3.1) to examine their distribution patterns in details. The dataset was also stratified into different subsets to examine distribution patterns of dolphin groups with different categories of group sizes, fishing boat associations, young calves and activities. Data from the long-term sighting databases were used to compare past distribution patterns of dolphins and porpoises in recent years to the one in the present study period.

4.5.2. Encounter rate analysis

Since the line-transect survey effort was uneven among different survey areas and across different years, the encounter rates of Chinese White Dolphins and finless porpoises (number of on-effort sightings per 100 km of survey effort) were calculated in each survey area in relation to the amount of survey effort conducted. The encounter rate could be used as an indicator to determine areas of importance to dolphins and porpoises within the study area.

4.5.3. Line-transect analysis

Density and abundance of Chinese White Dolphins were estimated by line-transect analysis using systematic line-transect vessel survey data collected under the present study. For the analysis, survey effort in each single survey day was used as the sample. Estimates were calculated from dolphin sightings and effort data collected during conditions of Beaufort 0-3 (see Jefferson 2000a), using standard line-transect methods (Buckland et al. 2001). The estimates were made using the computer program DISTANCE Version 6.0, Release 2 (Thomas et al. 2009). The following formulae were used to estimate density, abundance, and their associated coefficient of variation:

$$\hat{D} = \frac{n\,\hat{f}(0)\,\hat{E}(s)}{2\,L\,\hat{g}(0)}$$

$$\hat{N} = \frac{n\,\hat{f}(0)\,\hat{E}(s)\,A}{2\,L\,\hat{g}(0)}$$

$$C\hat{V} = \sqrt{\frac{\hat{var}(n)}{n^2} + \frac{\hat{var}[\hat{f}(0)]}{[\hat{f}(0)]^2} + \frac{\hat{var}[\hat{E}(s)]}{[\hat{E}(s)]^2} + \frac{\hat{var}[\hat{g}(0)]}{[\hat{g}(0)]^2}}$$

where D = density (of individuals),

n = number of on-effort sightings,
f(0) = trackline probability density at zero distance,
E(s) = unbiased estimate of average group size,
L = length of transect lines surveyed on effort,
g(0) = trackline detection probability,
N = abundance,
A = size of the survey area,
CV = coefficient of variation, and
var = variance.

A strategy of selective pooling and stratification was used in order to minimize bias and maximize precision in making the estimates of density and abundance (see Buckland et al. 2001). Distant sightings were truncated to remove outliers and accommodate modeling, and size-bias corrected estimate of group size was calculated by regressing $\log_e$ of group size against distance. Three models (uniform, half-normal and hazard rate) were fitted to the data of perpendicular distances. The model with the lowest values of Akaike's Information Criterion (AIC) was chosen as the best model and used to estimate f(0) and the resulting dolphin density and abundance (Buckland et al. 2001).

Besides estimating dolphin abundance for the four main areas of dolphin occurrences in 2016, annual abundance estimates were also generated for every year since 2001 in NWL and NEL survey areas and since 2003 in WL and SWL survey areas, to investigate any significant temporal trend using linear regression model. To perform such trend analysis, the linear regression model is considered in the four areas by Dr. Gilbert Lui from the Department of Statistics and Actuarial Science of the University of Hong Kong, as follow:

$$x_t = a + bt + u_t \qquad \text{for} t = 1, \ldots, n$$

where x_t denotes the abundance data of dolphin at time t, n is the number of observations, and u_t is an error term which follows normal distribution with mean zero and variance σ^2.

4.5.4. Quantitative grid analysis on habitat use

To conduct quantitative grid analysis of habitat use (Hung 2008), positions of on-effort sightings of Chinese White Dolphins and finless porpoises were retrieved from their long-term sighting databases, and then plotted onto 1-km^2 grids among the nine survey areas on GIS. Sighting densities (number of on-effort sightings per km^2) and dolphin/porpoise densities (total number of dolphins/porpoises from on-effort sightings per km^2) were then calculated for each 1 km by 1 km grid with the aid of GIS. Sighting density grids and dolphin/porpoise density grids were then further normalized with the amount of survey effort conducted within each grid. The total amount of survey effort spent on each grid was calculated by examining the survey coverage on each line-transect survey to determine how many times the grid was surveyed during the study period. For example, when the survey boat traversed through a specific grid 50 times, 50 units of survey effort were counted for that grid. With the amount of survey effort calculated for each grid, the sighting density and dolphin/porpoise density of each grid were then normalized (i.e. divided by the unit of survey effort).

The newly-derived unit for sighting density was termed SPSE, representing the number of on-effort **s**ightings **p**er 100 units of **s**urvey **e**ffort. In addition, the derived unit for actual dolphin/porpoise density was termed DPSE, representing the number of **d**olphins **p**er 100 units of **s**urvey **e**ffort. Among the 1-km^2 grids that were partially covered by land, the percentage of sea area was calculated using GIS tools, and their SPSE and DPSE values were adjusted accordingly. The following formulae were used to estimate SPSE and DPSE in each 1-km^2 grid within the study area:

$$SPSE = ((S / E) \times 100) / SA\%$$

$$DPSE = ((D / E) \times 100) / SA\%$$

where S = total number of on-effort sightings
D = total number of dolphins/porpoises from on-effort sightings
E = total number of units of survey effort
SA% = percentage of sea area

Both SPSE and DPSE values can be useful in examining dolphin/porpoise usage within a one square kilometre area. For the present monitoring study, both SPSE and DPSE values were calculated in each 1-km^2 grid among all survey areas for the entire one-year period in 2016 for both dolphins and porpoises, and in the past decade of monitoring (i.e. 2007-16) for finless porpoises.

4.5.5. Behavioural analysis

When dolphins were sighted during vessel surveys, their behaviours were observed. Different behaviours were categorized (i.e. feeding, milling/resting, traveling, socializing) and recorded on sighting datasheets. This data were then input into a separate database with sighting information, which was used to determine the distribution of behavioural data using a desktop GIS. Distribution of sightings of dolphins engaged in different activities and behaviours would then be plotted on GIS and carefully examined to identify important areas for different activities, and compared with past distribution patterns of such activities.

4.5.6. Ranging pattern analysis

For the examination of individual ranging patterns, location data of identified dolphins with 10 or more re-sightings that were sighted during the present study period were obtained from the dolphin sighting database and photo-identification catalogue. To deduce home range for individual dolphins using the fixed kernel methods, the program Animal Movement Analyst Extension, created by the Alaska Biological Science Centre, USGS (Hooge and Eichenlaub 1997), was loaded as an extension with ArcView© 3.1 along with another extension Spatial Analyst 2.0. Using the fixed kernel method, the program calculated kernel density estimates based on all sighting positions, and provided an active interface to display kernel density plots. The kernel estimator then calculated and displayed the overall ranging area at 95% UD (utilization distribution) level. The core areas of individuals at two different levels (50% and 25% UD) were also examined to investigate their range use in greater detail.

4.5.7. Residency pattern analysis

To examine the monthly and annual occurrence patterns of individual dolphins, their residency patterns in Hong Kong were carefully evaluated. “Residents” were defined as individuals that were regularly sighted in Hong Kong for at least eight years in the past 12 years (i.e. 2005-2016), or five years in a row within the same period. Other individuals that were intermittently sighted during the past years were defined as “Visitors”. In addition, monthly matrix of occurrence was also examined to differentiate individuals that occurred year-round (i.e. individuals that occur in every month of the year) or seasonally (i.e. individuals that occur only in certain months of the year). Using both yearly and monthly matrices of occurrence, “year-round residents” were the individual dolphins that were regularly sighted in Hong Kong throughout the year, while “seasonal visitors” were the ones that were sighted sporadically in Hong Kong and only during certain months of the year within the study period.

5. RESULTS AND DISCUSSIONS

5.1. Summary of Data Collection

5.1.1. Survey effort

During the 12-month monitoring period in April 2016 to March 2017, a total of 178 line-transect vessel surveys were conducted among ten survey areas in Hong Kong waters. These included 19 surveys in NEL, 21 surveys in NWL, 27 surveys in WL, 39 surveys in SWL, 29 surveys in SEL, 14 surveys in DB, 12 surveys in LM, seven surveys in PT, eight surveys in NP and two surveys in Sai Kung. The details of these survey effort data are presented in Appendix I.

As in the recent past monitoring periods, more survey effort were allocated to survey areas outside of North and West Lantau waters during the 2016-17 monitoring period, since additional surveys have been conducted in NWL, NEL and WL survey areas concurrently under the Hong Kong Link Road (HKLR) regular line-transect monitoring surveys as part of the EM&A works for the Hong Kong-Zhuhai-Macau Bridge (HZMB) construction. In addition, supplementary surveys have been conducted in SWL survey area since March 2015 commissioned by the Highways Department through their Environmental Project Office (ENPO). These additional HZMB-related dolphin monitoring surveys employed the same survey methodology, HKCRP personnel and research vessels to ensure consistency and full compatibility with the AFCD long-term dolphin monitoring programme. The survey data have also been made publicly available with regular updates through the HZMB ENPO website (www.hzmbenpo.com). In order to increase the overall sample size for the present monitoring study, such EM&A data were combined with the AFCD monitoring data for various data analyses presented throughout this report, which can provide valuable supplementary information on dolphin occurrence during the 2016-17 monitoring period.

In addition, two helicopter surveys were conducted with the Government Flying Services through the arrangement of AFCD on May 9th and October 5th of 2016 during the study period. These surveys mainly covered the eastern and southern waters of Hong Kong, and such off-effort data on local dolphins and porpoises collected from these surveys were also included in the distribution analysis and group size analysis.

Among the ten survey areas, 623.5 hours were spent to collect 5,662.5 km of survey effort during the AFCD monitoring surveys in 2016-17. The majority of these efforts (73.4% of total) were conducted in six areas where dolphins regularly occurred in the past, in which 22.8% of total effort were spent in NEL/NWL, 10.7% in WL, 34.9% in SWL/SEL and 5.0% in DB. In addition, 61.5% of total survey effort was allocated to survey areas in southern and eastern waters of Hong Kong (i.e. SWL, SEL, LM, PT, NP and SK) where porpoises frequently occur in the past. Notably, 93.5% of all survey effort was conducted under favourable sea conditions (Beaufort 3 or below, with good visibility). Such high percentage of survey effort conducted in favourable conditions is crucial to the success of the marine mammal data collection programme in Hong Kong, as only such data can be used in various analyses to examine their encounter rates, habitat use, and estimations of density and abundance.

During the same 12-month monitoring period from April 2016 to March 2017, a total of 5,195.4 km of survey effort was conducted in NEL, NWL, WL and SWL under the HZMB-related EM&A dolphin monitoring surveys respectively. This brings the total survey effort to 8,143.0 km for the combined dataset from AFCD and HKLR surveys among the four survey areas. Over 90% of the survey effort of HZMB-related EM&A surveys was also conducted under favourable sea conditions, which can be combined with the AFCD monitoring survey data for various analyses.

Since 1996, the long-term marine mammal monitoring programme coordinated by HKCRP has collected a total of 180,030 km of line-transect survey effort in Hong Kong and Guangdong waters of the Pearl River Estuary under different government-sponsored monitoring projects, consultancy studies and private studies, with 52.6% of the effort funded by AFCD. The survey effort in 2016 alone comprised 6.0% of the total survey effort collected since 1996.

5.1.2. Marine mammal sightings

Chinese White Dolphin - From the AFCD surveys alone, 199 groups of 638 Chinese White Dolphins were sighted during April 2016 to March 2017 (see Appendix II). And with the additional sightings contributed from various HZMB-related EM&A surveys, a total of 371 groups of 1,233 dolphins were sighted during the same 12-month period. Among these 371 dolphin groups from the combined dataset, 315 were sighted during on-effort line-transect vessel surveys, while the rest were made during off-effort search. Most dolphin sightings were made in WL (220 sightings) and SWL (83 sightings), comprising 81.7% of the total. On the other hand, dolphins occurred in a lesser extent in NWL (62 sightings), and very infrequently in SEL (five sightings). Despite the large amount of survey effort being conducted in NEL and

DB survey areas, only a lone individual was sighted in NEL, and no sighting was made in DB at all in 2016-17. As in previous monitoring periods, no dolphin was sighted at all in LM, PT, NP or SK survey areas, where porpoises regularly occur.

Finless porpoise - During the 12-month study period, 150 groups of 403 finless porpoises were sighted during vessel and helicopter surveys (see Appendix III). During on-effort search, a total of 123 porpoise sightings were made, which can be used in the encounter rate analysis and habitat use analysis. The porpoise groups were mainly sighted in SEL (74 groups), SWL (43 groups) and LM (19 groups) survey areas. In the eastern waters, six porpoise sightings were made in PT survey area, while another five and three groups were sighted in NP and SK survey areas respectively. As in the past, no porpoise was sighted in DB, NWL, NEL and WL survey areas where dolphins regularly occurred during the monitoring period.

5.1.3. Photo-identification of individual dolphins

From April 2016 to March 2017, over 24,000 digital photographs of Chinese White Dolphin were taken during AFCD monitoring surveys for the photo-identification of individual dolphins. All photographs taken in the field were compared with existing individuals in the photo-identification catalogue that has been compiled by HKCRP since 1995. All new photographs identified as existing or new individuals during the study period, as well as any updated information on gender and age class of individual dolphins, were incorporated into the photo-identification catalogue. Significant amount of photo-identification data were also contributed from the HZMB-related surveys during the same 12-month period.

Up to January 2017, a total of 920 individual Chinese White Dolphins have been identified by HKCRP researchers in Hong Kong waters and the rest of the Pearl River Estuary. These included 20 new individuals being added to the catalogue during 2016, all of which were newly-identified in Hong Kong waters for the first time. In the current catalogue, 552 individuals were first identified within Hong Kong territorial waters, while the rest were first identified in Guangdong waters of the Pearl River Estuary. Moreover, 285 individuals have been seen 10 times or more; 220 individuals have been seen 15 times or more; 128 individuals have been seen 30 times or more; and 88 individuals have been seen 50 times or more. On the contrary, about 44% of the identified individuals have only been seen once or twice, with most of these being first identified in Guangdong waters (286 out of 409 individuals). Temporal trends in the total number of identified individuals, the total number of re-sightings made, and the number of individuals within several categories of number of re-sightings showed that good progress has been made in photo-identification works during the 2016-17 monitoring period (Figure 3).

During the present monitoring period (April 2016-March 2017), a total of 150 individuals, sighted 352 times altogether, were identified during AFCD regular vessel surveys (Appendix IV). In addition, 148 individuals were also identified 364 times during HZMB-related monitoring surveys in NEL, NWL, WL and SWL during the same 12-month period. More than half of the re-sightings of individual dolphins made during AFCD/HZMB surveys were in WL survey area, comprising 56.7% of the total, while re-sightings were also made regularly in NWL (23.6%) and SWL (18.9%) survey areas. On the contrary, only six re-sightings of four individuals were made in SEL survey areas, while no individual was re-sighted at all in NEL and DB survey areas.

Among the identified individuals sighted over the 12-month study period from the combined dataset from AFCD/HZMB surveys, most of them were re-sighted only a few times, but some have been repeatedly re-sighted, indicating their strong reliance of Hong Kong as an important part of their home range. For example, ten individuals were re-sighted more than 10 times from the combined dataset during the relatively short study period. Almost all of these repeatedly-sighted individuals are considered year-round residents (see Section 5.7.1), and seven of the ten individuals (except NL136, and the mother-calf pair NL202/NL286) centered their range use in WL and SWL waters. This is in contrast to past monitoring periods that most frequently sighted individuals centered their range use in North Lantau waters.

As in the previous two monitoring periods, a number of year-round residents that were frequently sighted in Hong Kong waters in the past have only occurred occasionally, or even disappeared during the 2016-17 monitoring period. For example, with similar amount of survey effort during the past four monitoring periods, WL50 and NL188 have both disappeared since June and July 2015 respectively, even though the two individuals were sighted 46 and 51 times respectively during 2012-15. Moreover, there were a total of 11 frequently-sighted individuals (e.g. SL27, WL11) that have disappeared from Hong Kong waters in 2016, and many of them were considered year-round or seasonal residents in the past. Apparently some of them may have moved temporarily or permanently into Mainland waters (see Hung 2016), and some could have already been dead.

5.1.4. Shore-based theodolite tracking

In the previous two monitoring periods, shore-based theodolite tracking works were conducted at Shek Kwu Chau as a feasibility study on the application of such tracking technique on finless porpoises. In 2016-17 monitoring period, ten theodolite-tracking sessions were conducted from Shek Kwu Chau station to assess whether the porpoises can be reliably tracked from this land-based station, and to study their behaviours and movements in southern waters of Hong Kong.

Between April 2014 and March 2017, a total of 18 sessions of theodolite tracking were conducted at Shek Kwu Chau, and 62 groups of finless porpoises with 665 fixes of their positions were collected from this site (Appendix V). Moreover, another 1,048 fixes were also made from locations of fishing boats and other types of vessels from this tracking station. As the sample size of porpoise tracks remains fairly small due to the great difficulty to locate them at sea and track them over time, continuous porpoise tracking should be conducted at Shek Kwu Chau during their peak occurrence in December to May of every year in order to increase the sample size. The ultimate goal is to develop some baseline information on porpoise occurrence, behaviour and movement patterns at this important porpoise habitat.

5.2. Distribution

5.2.1 Distribution of Chinese White Dolphins

During the 12-month monitoring period in 2016-17, Chinese White Dolphins were frequently sighted to the west and southwest of Lantau Island, but to only a smaller extent in NWL waters during the AFCD monitoring surveys and HZMB-related surveys (Figures 4-5).

In 2016 alone, with the combined effort from AFCD and HZMB-related surveys, dolphin occurrence in North Lantau mainly clustered at the northwestern end of the region, mostly around and to the north of Lung Kwu Chau (Figure 6). For the rest of the North Lantau waters, dolphins were almost absent from the central, eastern and southwestern portions, with the exception of two sightings made near the northern landfall of Tuen Mun-Chek Lap Kok Link and the Hong Kong Boundary Crossing Facilities respectively, and the three sightings near Shum Wat adjacent to the Hong Kong Link Road. Moreover, there was only a single dolphin sighted very briefly between Sham Shui Kok and Yam O in NEL. In fact, this extremely rare sighting was also one of the two lone dolphins only sighted in NEL region since August 2014.

On the contrary, dolphins were regularly and frequently sighted along the stretch of waters from Tai O Peninsula in WL, to Fan Lau and Kau Ling Chung in SWL during the 2016 monitoring surveys (Figure 7). In WL waters, dolphin sightings were more concentrated near Fan Lau, Tai O Peninsula and Kai Kung Shan, while it appeared that more dolphins were sighted inshore than offshore waters along the narrow strip of WL survey area (Figure 7). In SWL waters, besides the higher concentration of dolphin sightings along the coastlines from Fan Lau to Shui Hau Peninsula, dolphin groups were also sighted between the Soko Islands, and to the west and north of the group of islands (Figure 7). Notably, three dolphin sightings were made in SEL survey area, and all three groups were sighted at the western end of Chi Ma Wan Peninsula (Figure 7).

<u>Temporal change in annual distribution patterns (2011-16)</u>

Using AFCD survey data alone, dolphin distribution patterns in the previous five years were compared with the one in 2016 to examine any temporal change in dolphin usage around Lantau waters (Figure 8). Several notable differences were observed. First, dolphin occurrence in NEL has progressively diminished starting in 2013, and reached to the lowest point in 2015-2016 with no dolphin being sighted there at all in the past two years, even though this area has been frequently utilized by dolphins as their important habitat in 2011-12, especially around the Brothers Islands (Figure 8). The significant decline in dolphin usage of the NEL waters has raised serious concerns on whether the on-going construction works of HZMB since 2012 has been seriously affecting dolphin usage in this area in addition to the other anthropogenic disturbances, with no sign of recovery at all.

In addition to the dramatic decline in dolphin usage of NEL waters in recent years, such decline has also been extended to the rest of North Lantau waters since 2014 (Figure 8). In the past, the waters within and around Sha Chau and Lung Kwu Chau Marine Park, as well as the adjacent waters between Pillar Point and the airport platform (including the Urmston Road) have served as important dolphin habitats with their frequent occurrence. However, their occurrence in NWL in 2014 was largely limited to the northwestern portion of the survey area, and such occurrence have further shrunk with very limited occurrence just around Lung Kwu Chau in 2015 (Figure 8). In 2016, only a few sightings were made around the island, which is the remaining area where dolphins occurred at all in the North Lantau region.

Furthermore, dolphins were frequently sighted to the west of the airport platform in the earlier years of 2011-12, but have greatly diminished their usage of this area in recent years of 2014-16. This area at the juncture of NWL and WL survey areas have been identified as important traveling corridor for dolphins to move between the two areas before HKLR construction (Hung 2014). More importantly, this area also serves as an important habitat for individual dolphins from both northern and southern social clusters in Hong Kong to come into contact (Dungan et al. 2012). The rare occurrence of dolphins from the coastal waters between Sham Wat and the western end of airport platform could be affected by the bored piling works of the HKLR construction in the past few years, and the physical presence of permanent bridge piers since the completion of piling works that may have obstructed their movements. Continuous monitoring of north-south movement of dolphins across the bridge alignment would be critical to determine whether there is any sign of recovery of dolphin usage in this area in the near future.

Another notable observation is that after a strong surge of dolphin usage in SWL waters in 2014-15, the level of usage in 2016 has apparently diminished back to the 2013 level. Since there was strong evidence of individual range shift into SWL waters as shown in previous monitoring period (Hung 2016), it should be looked into whether such shift has been reversed for some individuals in 2016, which will be further examined in Section 5.7.3.

In the past six years, the coastal water of West Lantau was the only area where consistent and frequent occurrence of dolphins was recorded (Figure 8). As mentioned repeatedly in previous monitoring reports (e.g. Hung 2015, 2016), this highlights once again the urgent need for the protection of this remaining important dolphin habitat in Hong Kong, in light of the continuous development pressure and anthropogenic activities seriously affecting dolphin occurrence in other parts of their local range.

5.2.2. Distribution of finless porpoises

During the 12-month period in 2016-17, the finless porpoises were mostly sighted to the south of Soko Islands and Cheung Chau, around Shek Kwu Chau, and between the waters of Soko Islands and Shek Kwu Chau (Figure 9). Some porpoises were also sighted in the coastal waters of South Lantau near Shui Hau Peninsula and Chi Ma Wan Peninsula, to the west of Lamma Island, near Po Toi Islands, and in the offshore waters to the east of Ninepins Islands and Sai Kung Peninsula (Figure 9). On the contrary, they rarely occurred to the western end of South Lantau waters, to the east of Lamma Island (i.e. south of Hong Kong Island), and the coastal waters in NP and SK survey areas (Figure 9). Notably, a rare porpoise sighting was made adjacent to the western entrance of the Aberdeen typhoon shelter, which was their first occurrence in this area.

Seasonal pattern of porpoise occurrence was also evident in South Lantau waters, where consistent survey effort was allocated in SEL and SWL throughout the year. During the summer and autumn months, most porpoise groups were sighted near the southern territorial boundary in SEL and SWL survey areas, while only a handful of sightings were made near Shek Kwu Chau, but not at all to the south of Cheung Chau area (Figure 9). On the contrary, porpoise sightings were more evenly spread in these waters during the winter and spring months.

When compared with the porpoise distribution patterns in the previous three years, it is apparent that porpoises have consistently and frequently occurred between the waters of Soko Islands and Shek Kwu Chau in South Lantau waters, and to the south of Cheung Chau in 2013-16 (Figure 10). Some of these areas have been proposed to be established as marine parks in upcoming years, which would certainly offer some protection of these important porpoise habitats. On the contrary, porpoise occurrence in Lamma waters was more varied in the past four years, with greatly diminished occurrence in 2014 and 2015 and slightly higher usage in 2016 to the west of the Island (Figure 10). Moreover, in the eastern waters of Hong Kong, porpoises occurred more frequently in 2015 than in 2014 or 2016 (Figure 10)

5.3. Habitat Use

5.3.1. Habitat use patterns of Chinese White Dolphins

For the quantitative grid analysis on habitat use, the SPSE and DPSE values (i.e. sighting densities and dolphin densities respectively) were calculated in all grids among the six survey areas where Chinese White Dolphins regularly occurred during 2016, which was also compared to the annual patterns in the past five years.

In 2016, important dolphin habitats are mostly located along the coastal waters of West Lantau, stretching from Tai O Peninsula, Kai Kung Shan, Peaked Hill to Fan Lau (Figure 11). The few grids around Siu A Chau in SWL and to the east of Lung Kwu Chau in NWL also recorded high dolphin densities during 2016 (Figure 11). In contrast, the northern end of WL survey area, the entire North Lantau region with the exception of the waters around Lung Kwu Chau recorded zero to low dolphin densities (Figure 11). Even though dolphin densities were recorded in most grids in SWL waters, most of them recorded low to moderate dolphin usage, while the dolphins appeared to avoid the eastern and southern ends of the survey area (Figure 11). Only two grids recorded very low dolphin densities in SEL survey area, and no grid recorded any dolphin density at all in NEL and DB survey areas in 2016.

Temporal changes in dolphin habitat use patterns (2011-16)

A comparison was made among the habitat use patterns in the past six years to examine whether there was any recent temporal change in densities at various important dolphin habitats in western waters of Hong Kong. In WL, dolphin habitat use patterns were similar across the six-year period, but apparently the usage has slightly diminished in 2016 with only moderately high densities among most grids where high densities were recorded in the past few years (Figure 12). When compared to the earlier years, dolphin usage in the northern portion of WL survey area that overlapped with the HKLR09 alignment was consistently lower in recent years of 2014-16 than in the earlier years in 2011-13 before the HKLR construction (Figure 12).

In SWL waters, dolphin usage was higher and more evenly spread in 2014-16 than in earlier years (Figure 12). However, most grids in 2016 only recorded low to moderate dolphin densities, which was largely contrasted with the habitat use patterns in 2014-15 with many grids recorded high to very high dolphin densities (Figure 12).

In contrary to the relatively high and consistent dolphin usage in WL and SWL waters in recent years, the temporal change in dolphin habitat use pattern was the exact opposite in North Lantau region, with greatly diminished dolphin occurrence in recent years (Figure 13). In the earlier years of the six-year period, dolphin usage was evenly spread throughout the North Lantau region, with high dolphin densities recorded around the Brothers Islands and Shum Shui Kok, Lung Kwu Chau and Sha Chau, as well as near Black Point, Pillar Point and to the west of the airport platform near Shum Wat (Figure 13). However, in 2015-16, dolphin usage was largely confined to the western end of the North Lantau region, and the habitat use in 2016 was further shrunk to mostly around Lung Kwu Chau, with the majority of the region recording zero to very low dolphin densities (Figure 13). The dramatic change in dolphin usage in North Lantau region have been discussed in details in the previous monitoring report (Hung 2016), and will be further examined throughout the rest of this report.

Temporal changes in habitat use patterns at six key habitats (2004-16)

The temporal trends in dolphin usage at six key habitats were also examined between 2004-16, which included the two existing marine parks around Sha Chau and Lung Kwu Chau as well as the Brothers Islands, the two proposed marine parks at Fan

Lau (i.e. Southwest Lantau) and around the Soko Islands, and two other "dolphin hot spots" at Tai O and Black Point where they regularly occurred in the past (Figure 14). To examine dolphin usage over these six key habitats that encompass a suite of grids, the number of on-effort sightings and unit of survey effort were pooled together from those grids, to calculate dolphin densities (DPSE) as a whole for each year during the 13-year study period of 2004-16 for examination of their temporal trends.

Firstly, a continuous decline in dolphin usage was recorded within the Sha Chau and Lung Kwu Chau Marine Park (17 grids) in the past four years (Figure 15). In fact, the dolphin density in 2016 within this existing marine park was the lowest since 2004, with an alarming decline of 85% in DPSE values over the 13-year period. As the first existing marine park established for dolphin conservation purpose since 1996, dolphin usage there would be a useful reference on whether such conservation measure would be an effective tool to provide a safe haven for the dolphins. With the dramatic decline in dolphin usage of this marine park, this should raise serious concern on its long-term viability.

The Brothers Marine Park (15 grids) was newly established in December 2016 as a compensation measure for the habitat loss in relation to the reclamation works of the Hong Kong Boundary Crossing Facilities. Within this marine park, the dolphin density remained at zero in 2016 as in 2015, after a dramatic decline in dolphin usage since 2011 (Figure 15). Although dolphin usage was originally expected to recover after the peak of construction activities in association with the Hong Kong Boundary Crossing Facilities and other bridge-related works has passed, their occurrence around the Brothers Islands has still remained extremely rare in the past few years. Unfortunately, only a few kilometers away from this marine park, reclamation works for the third runway expansion project have commenced in mid-2016. Since the third runway works area serve as an important traveling corridor for dolphins to move between the Brothers Marine Park and Sha Cha and Lung Kwu Chau Marine Park (Hung 2014), the massive reclamation project would further hamper any chance of recovery in dolphin usage around the Brothers Islands. Monitoring of dolphin usage within this marine park would be critical in the near future, and passive acoustic monitoring could be implemented within the marine park to determine whether there is any night-time usage by the dolphins when marine works and traffic is at a lower level.

Among the two existing marine parks and two proposed marine parks, the proposed Southwest Lantau Marine Park (15 grids) recorded the highest level of dolphin usage during the 13-year period (Figure 15). However, after reaching the peak in dolphin densities in 2014, dolphin densities (i.e. DPSE values) have steadily dropped in 2015 and 2016 back to the level of earlier years (Figure 15). Another proposed marine park around the Soko Islands (20 grids) also showed a decline in dolphin densities in the past few years, but the level of dolphin usage in 2014-16 was still much higher than the previous years (Figure 15). Dolphin usage of these proposed marine parks that are expected to be established in 2018 to 2019 should be continuously monitored, as both have covered some important habitats for the dolphins, and also for the porpoises around the Soko Islands.

As one of the dolphin hot spots in western waters of Hong Kong, the waters around Tai O Peninsula (four grids) consistently recorded high dolphin densities throughout the past decade (Figure 15). However, after a gradual increasing trend from 2004 to the highest in 2009, dolphin usage of this important habitat has declined to the lowest level in 2016, which also coincided with the decline in dolphin usage of the nearby proposed Southwest Lantau Marine Park (Figure 15). The diminished usage of dolphins in this important habitat in recent years could be related to the dolphin-watching activities originated from Tai O fishing village, as well as the nearby HZMB construction. On the other hand, dolphin usage at Black Point (four grids) has greatly fluctuated with no apparent trend, and such usage has been exceptionally low in the past three years of 2014-16 (Figure 15). As this area is situated at the border of a proposed large-scale reclamation site at Lung Kwu Tan, special attention should be paid on dolphin habitat use in this general area in the near future.

5.3.2. Habitat use patterns of finless porpoises

The habitat use patterns of finless porpoises were examined by calculating SPSE and DPSE values in grids across the five survey areas where they regularly occurred (i.e. SWL, SEL, LM, PT and NP) for the entire year of 2016. The spatial pattern of porpoise habitat use revealed that their most heavily utilized habitats for the year included the waters to the south of Cheung Chau, to the west of Shek Kwu Chau and Lamma Island (Figure 16). A number of grids in LM, PT and NP survey areas also recorded high to very high porpoise densities (Figure 16), but those results could be biased by the relatively low amount of survey effort conducted during the 12-month study period and should be treated with cautions.

In order to increase the sample size, the survey effort and porpoise data collected from 2007-16 were pooled and analyzed for a longer period with sufficient amount of survey data, for a better presentation of porpoise habitat use pattern in southern and eastern waters of Hong Kong. Since finless porpoises in Hong Kong exhibited pronounced seasonal pattern of distribution, with rare occurrence in each survey area during certain period of the year (Hung 2005, 2008; Jefferson et al. 2002), the ten-year dataset was further stratified into winter/spring (December through May) and summer/autumn (June through November) to deduce habitat use patterns of porpoises for the dry and wet seasons respectively. The Sai Kung survey area was also included for the first time for the porpoise habitat use analysis for the summer/autumn months.

For the examination of porpoise habitat use patterns during the dry season (winter and spring months) in 2007-16, in which the majority of survey effort was allocated to SWL, SEL and LM survey areas, the grids with high porpoise densities were mostly located around Shek Kwu Chau and at the offshore waters in the South Lantau region (Figure 17). In particular, important porpoise habitats during the dry season could be found to the south of Tai A Chau, west and southwest of Shek Kwu Chau, south of Cheung Chau, and at the offshore waters between Shek Kwu Chau and the Soko Islands (Figure 17). Porpoise density was also moderately high at the southwest portion of LM survey area, and to the east of Shek Kwu Chau (Figure 17). On the contrary, most grids toward the western end of SWL, the coastal waters between Fan Lau and Chi Ma Wan Peninsula (including Pui O Wan), and the southern and eastern waters of Lamma Island only recorded low to moderately low densities of porpoises. They also generally avoided Fan Lau and Kau Ling Chung in SWL survey area, the northern portion of LM survey area, and the offshore area at the juncture of SEL and LM survey areas (Figure 17).

During the wet season (summer and autumn months), more survey effort were allocated to the eastern survey areas (i.e. PT, NP and SK), while the survey effort remained relatively consistent in SWL and SEL waters year-round. It should also be noted that much fewer surveys were conducted in LM waters during the wet seasons of 2007-16. During the summer and autumn months, porpoise densities were generally higher around the Po Toi Islands, and at the juncture of PT and NP survey areas (Figure 18). Although porpoise densities at some grids in NP and SK waters were very high, these results could be biased as the survey effort accumulated over the ten-year period in this survey area was still relatively low (less than 10 units of survey effort in total for most grids). On the other hand, even though porpoises occurred in South Lantau and Lamma waters during the wet season, their densities were generally low to moderately low, with no particular habitat preference in these areas during these months. In fact, most of the grids that recorded porpoise densities in the wet season were located at the southern halves of SWL, SEL and LM survey areas (Figure 18), indicating their occasional visits across the southern territorial boundary of Hong Kong from neighbouring Chinese waters during the wet seasons.

5.4. Group Size, Calf Occurrence and Activities

5.4.1. Group sizes of dolphins and porpoises

During the 12-month study period, group sizes of Chinese White Dolphins ranged from singles to 13 animals, with an overall mean of 3.3 ± 2.66. Among the six areas where dolphins occurred in 2016-17, the mean group size was the lowest in NEL (1.0, with only a single animal sighted) and SEL (1.4, with five groups of seven dolphins) but the highest in NWL (3.8). Among the four seasons, mean group sizes were slightly lower in summer (3.0 dolphins per group) and slightly higher in spring (3.8) than the overall mean. Most dolphin groups sighted during the 2016-17 monitoring period were quite small, with 52.6% of the groups composed of 1-2 animals, and 74.7% of the groups with fewer than five animals (Figure 19). Only 13 out of the 371 groups contained more than ten animals per group.

In 2016, the smaller groups of dolphin were found throughout the distribution range of dolphins in North, West and South Lantau waters (Figure 20). Notably, the dolphin groups that occurred in the peripheral distribution range, such as the three sightings in SEL, the two sightings in central and eastern portions of North Lantau, and all sightings within and around the Soko Islands, were dominated by these smaller groups (Figure 20). In contrast, the larger dolphin groups were mostly clustered along the west coast of Lantau, near Fan Lau and around Lung Kwu Chau (Figure 20). These larger aggregations could possibly be related to good feeding opportunities for the dolphins.

The examination of long-term trend in annual mean dolphin group sizes since 2002 revealed that the one in 2016 (3.3 dolphins per group) was the lowest in the past decade (as in 2012 and 2013), which was followed by the much higher annual means recorded in 2014 and 2015 (Figure 21). It is uncertain whether the fluctuation in group dynamics in the past few years could be potentially linked with any changes in the dolphins' foraging strategies in midst of increased disturbance from the construction activities in recent years, or simply as a response to changes in prey distribution and overall prey resources in western waters of Hong Kong.

During the 12-month monitoring period in 2016-17, the porpoise group sizes ranged from singles to 17 animals, with an overall mean of 2.7 ± 2.48. This mean group size was lower than the ones in recent years of porpoise monitoring. Most of the porpoise groups sighted during the monitoring period were very small, with 64.0% of porpoises groups composed of 1-2 animals, and all except 26 groups had less than five animals per group (Figure 22). The mean group sizes in SWL (2.4), SEL (2.7) and NP (2.2) were close to or slightly lower than the overall mean, while the ones in LM (3.3) and PT (3.3) were higher than the overall mean. Distinct seasonal variation in mean group sizes was evident, with much lower mean group size in summer months but a higher mean in spring months.

5.4.2. Calf occurrence of dolphins

Of the 1,233 dolphins sighted during the 2016-17 monitoring study period, 66.3% of them were categorized into six age classes. Among these age classes, the spotted juveniles (24.1%) dominated the largest proportion of dolphins being identified with their age classes. Moreover, only 17 unspotted juveniles (UJ) were sighted during the 12-month period, with these young calves comprised of 1.4% of the total. Surprisingly, no unspotted calf (i.e. UC, or newborn calf) was sighted at all from the combined dataset during the 12-month period.

Temporal trend in annual occurrence of young calves revealed that the percentage of young calves (UCs and UJs combined) in 2016 was the lowest during the 15-year period of 2002-16, with only one UC and 20 UJs sighted for the entire year (Figure 23). The paucity of young calf sightings in 2016 as well as the continuous declining trend in their occurrence in the past 15 years is certainly a serious matter of grave concern, as this casts a very worrying future for the local dolphin population with very low level of recruitment. As mother-calf pairs are more susceptible to anthropogenic disturbances, the exceptionally low percentages of young calves in the past several years raised legitimate concerns on the suitability of Hong Kong waters for reproduction of calves and nursing activities for mother-calf pairs, in light of the adverse impacts of various coastal development projects and high level of vessel activities within their habitats.

Distribution of young calves in 2016 is shown in Figure 24, with most of these sightings made along the WL coastlines near Fan Lau, Peaked Hill and Tai O Peninsula (Figure 24). The only newborn calf sighted during the year was located at Fan Lau. In contrast, no young calves were sighted at all in NWL, NEL or SEL waters, and only one UJ was sighted to the north of HKLR alignment (Figure 24).

The examination of the temporal trends in distribution of UCs and UJs in 2011-16 revealed that such temporal changes resembled some similarities to the overall distribution of dolphins during the six-year period, with the gradual disappearance of young calves from the NEL region starting in 2013, and then to the entire North Lantau region in 2015-16 (Figures 25-26). Moreover, such distribution was further shrunk to the limited area of WL waters, with gradual decline in the frequency of occurrence for both UCs and UJs even in this once-important habitat for nursing activities in the past (Figures 25-26). On the contrary, even though there was a resurgence of overall dolphin usage in SWL waters in recent years, the calf occurrence there was still very infrequent, with the exception of the tip of Fan Lau (Figures 25-26). Overall, the dramatically shrinking distribution of dolphin calves over the past six years is quite alarming, as it may signal the significant degradation of dolphin habitats in western Hong Kong waters as suitable nursing habitats for mother-calf pairs of Chinese White Dolphins.

5.4.3. Activities of dolphins

A total of 44 and 12 groups of dolphins were observed to be engaged in feeding and socializing activities respectively during the 2016-17 monitoring period, comprising of 11.9% and 3.2% of all dolphin groups. In addition, there was one group engaged in traveling activity, while none was engaged in milling/resting activity at all during the 12-month study period.

Temporal trend in annual percentages of feeding and socializing activities revealed that after a slight rebound in the past few years, both percentages dropped to a lower point in 2016 (Figure 27). In fact, the percentage of feeding activities in 2016 was the lowest among all years since 2002, while the one for socializing activities in 2016 was the second lowest (previous low was in 2012 with 3.3%). The continuous declining trend on the occurrence of both activities was apparent for the 2002-16 period, which is of grave concern as these activities serve important functions in the daily lives of the dolphins. Such worrying trend could also signal the deterioration of the overall habitat quality in western Hong Kong waters for Chinese White Dolphins, as the anthropogenic disturbances continue to affect their different usage of Hong Kong waters.

Distribution of dolphins engaged in different activities in 2016 is shown in Figure 28. Most feeding activities occurred along the stretch of WL/SWL coastlines from Kai Kung Shan, Fan Lau to Shui Hau Peninsula (Figure 28). Some of these feeding activities were also found near Lung Kwu Chau and HKLR alignment. On the other hand, the socializing activities were mainly concentrated near Kai Kung Shan and Peaked Hill, as well as the southwestern edge of the Shui Hau Peninsula (Figure 28). Notably, two dolphin groups engaged in socializing activities were found adjacent to the HKLR09 alignment and the northern landfall of TMCLKL. The two sightings engaged in traveling activities were both located near Kai Kung Shan, even though this area is not previously identified as a major traveling corridor for the dolphins (Figure 28).

Temporal changes in distribution of dolphins engaged in feeding and socializing activities were also examined for the six-year period of 2011-16. For feeding activities, the temporal changes in sighting distribution patterns closely resembled with the overall dolphin distribution for the same six-year period. Feeding activities occurred frequently in North Lantau region, especially around the Brothers Islands, in 2011-2012, but have quickly diminished first in NEL in 2013-2014, then in the entire North Lantau region in 2015-2016, when the occurrence of such activity has become increasingly rare (Figure 29). Moreover, feeding activities were frequently encountered from 2011-15 in WL waters, but such encounters became less frequent there in 2016 (Figure 29). On the contrary, there was an increasing occurrence of the feeding activities in SWL waters in 2014-2015, and to a lesser extent in 2016 (Figure 29).

The temporal changes in distribution of dolphin sightings engaged in socializing activities in 2011-16 were also similar to the ones in feeding activities, with regular occurrence in North Lantau in 2011-14, but such occurrences diminished noticeably in 2015-2016 (Figures 30). Socializing activities remained frequent in WL waters throughout the six-year period, but with higher occurrence in 2015 and lower occurrence in 2012 and 2016 (Figure 30). Socializing activities did not occur at all in South Lantau waters in 2011-13, but a few groups engaged in such activities were sighted in each year of 2014-16 (Figure 30).

5.4.4. Dolphin associations with fishing boats

Among the 371 groups of dolphins sighted in 2016-17, 16 of them were associated with operating fishing boats, including purse-seiners (ten groups), gill-netters (three groups), pair trawlers (two groups) and a single trawler (one group), or 4.3% of all dolphin groups. In 2016, the percentage of dolphin sightings associated fishing boats has dropped further to the lowest since 2002. It is suspected that the dramatic decline in fishing boat association in recent years was partly related to the trawling ban implemented in December 2012. But there also appeared to be much fewer associations with purse-seiners in 2016, which could also be related to possible decline in fishery resources that dolphins would not take the risk to be associated with these operating fishing vessels.

Spatial distribution of dolphin groups associated with different types of fishing boats in 2016 revealed that the three associations with purse-seiners occurred in the inshore waters between Shui Hau Peninsula and Kau Ling Chung, while the other three associations with gill-netters were located near Fan Lau and Lung Kwu Chau respectively (Figure 31). Association with other type of fishing boat was exceptionally rare in 2016, which only included an association with a pair trawler to the south of Tai A Chau, adjacent to the southern territorial border of Hong Kong (Figure 31).

5.5. Encounter Rate

5.5.1. Encounter rates of Chinese White Dolphins

For the calculations of dolphin encounter rates, only survey data collected in Beaufort 0-3 conditions was included in the analysis as in past monitoring periods (e.g. Hung 2015, 2016).

From April 2016 to March 2017, the combined encounter rates of dolphins from NEL, NWL, WL and SWL was 4.1, which was the lowest among all monitoring periods since 2002 (the previous low was 4.7 in 2015-16 monitoring period; Figure 32). In the past six monitoring periods, there has been a steady decline of dolphin encounter rates, dropping from 7.7 in 2011-12 to 4.1 in 2016-17. As consistently recorded in past monitoring periods, dolphin encounter rate was the highest in WL (14.9) among the four survey areas, which was considerably higher than in SWL (3.2) and NWL (1.9). The encounter rate in NEL was 0.0 as no on-effort dolphin sighting was made out of the 1,852.1 km of survey effort. It should be noted that similar to the previous three monitoring periods, dolphin encounter rate in SWL was much higher than the one in NWL in 2016-17, which was the opposite to the earlier years.

Temporal trend in annual encounter rate

Temporal trends in annual dolphin encounter rates were examined for the overall combined areas (i.e. NEL, NWL, WL and SWL), as well as the two main areas of dolphin occurrence in North Lantau and WL/SWL regions, where the two social clusters of individual dolphins primarily occur respectively (see Dungan et al. 2012). For the overall encounter rate of the combined areas, it reached the lowest in 2016 for the 15-year period of 2002-16 (Figure 33). In fact, there was a sharp decline between 2015 and 2016, falling from 7.5 dolphin sightings per 100 km of survey effort in 2015 to only 5.3 in 2016.

In North Lantau region (with NEL and NWL combined), the dramatic decline in dolphin encounter rate between 2011-16 was even more apparent, with a noticeable decline from 7.7 dolphin sightings per 100 km of survey effort in 2011 to only 0.8 in 2016, or a 90% decline during the six-year period (Figure 33). On the other hand, after a three-year period of 2013-15 with relatively higher encounter rates (12.1-13.6), the combined dolphin encounter rate from the WL/SWL region dropped noticeably to only 8.7 dolphin sightings per 100 km of survey effort in 2016, which was also the lowest since 2002 (Figure 33). As examined in Hung (2016), there were many cases of range shifts and expansion by individual dolphins from the northern social cluster to the WL/SWL region, while the ones from the southern social cluster have expanded their range use from WL waters into SWL waters. From the temporal trend in encounter rates up to 2016, it appeared that such range shifts and expansions could not fully explain the decline in encounter rates in all four survey areas, especially with the further decline in WL/SWL region. This will be further examined in Section 5.7.3.

Temporal changes in encounter rates in relation to HZMB construction

As in previous monitoring periods, the encounter rates of dolphins in each quarter of the six-year period of 2011-16 were calculated in NEL and NWL survey areas for the examination of any changes in dolphin occurrence associated with the marine works of HKBCF, HKLR and TMCLKL as the three main components of the HZMB construction since 2012.

In NEL, after experiencing noticeable drops in dolphin encounter rates in all four quarters since 2012 to nearly zero in 2015, it remained at zero for all four quarters of 2016 with no dolphin being sighted at all during the on-effort line-transect surveys (Figure 34). Furthermore, after a steady decline in dolphin encounter rates occurred in NWL during all four quarters in the past five years, the encounter rates further dropped to the lowest point for all four quarters of 2016, with no sign of recovery in dolphin usage at all. Apparently, the dramatic and consistent decline in dolphin occurrence among all four quarters has been expanded from NEL to the entire North Lantau region in the past several years (Figure 34).

In relation to the HZMB construction schedule, both HKBCF and HKLR03 reclamation works in NEL region commenced in the second and fourth quarters of

2012 respectively, while the reclamation works of TMCLKL northern landfall and bored piling works of TMCLKL southern viaduct commenced in the fourth quarter of 2013 and first quarter of 2014 respectively. The commencement of these construction works all coincided with a further drop in dolphin encounter rates in the respective quarter in NEL waters (Figure 34). Such drop was even more prevalent in 2015 and 2016, when dolphin encounter rate reached zero in most quarters in NEL (Figure 34). The commencement of HKLR09 piling works at the juncture of NWL and WL survey areas in the second quarter of 2013 also corresponded to a decline in dolphin encounter rate in NWL during the same period (Figure 34). In fact, the encounter rate in NWL dropped to the lowest level in 2016 since the HZMB-related works has commenced, indicating that the construction impacts have already extended to the entire North Lantau region.

It is evident that the HZMB-related construction works have played a pivotal role in the marked decline in dolphin usage of North Lantau region in the past several years, which have also resulted in a complete abandonment of their once-important habitat around the Brothers Islands, and dramatically reduced usage of North Lantau waters as a whole. Unfortunately, even though the HZMB-related construction works have well past their peak in 2015 and 2016, there was no sign of recovery from the continuous decline in dolphin usage, apparently due to some lingering effects from the HZBM-related construction works. With the additional 650 hectares of habitat loss and intense construction activities with elevated vessel traffic stemmed from the airport's third runway expansion project commenced in mid-2016, it is certainly worrisome about the future usage of dolphins in the North Lantau region, and the long-term viability of the two existing marine parks at the Brothers Islands as well as around Sha Chau and Lung Kwu Chau.

5.5.2. Encounter rates of finless porpoises

As in previous monitoring periods, encounter rates of finless porpoises were calculated using data collected in Beaufort 0-2 conditions, since the porpoise encounter rate was consistently much lower in Beaufort 3-5 conditions (0.8 porpoises per 100 km of survey effort) than in Beaufort 0-2 conditions (3.7) during the present monitoring period. In 2016-17, the combined encounter rate of SWL, SEL, LM and PT was 3.7 porpoise sightings per 100 km of survey effort, which was lower than the ones in the previous five monitoring periods (2011-16), but was slightly higher than the ones in earlier years of 2007-11. Among the five survey areas, the porpoise encounter rates was the highest in SEL (8.1). On the contrary, the ones in NP (2.9), SWL (2.8) and LM (2.5) were slightly lower than the overall encounter rate, while the one in PT (1.8) was much lower than the overall.

Temporal trend in annual porpoise encounter rates from the combined areas of SWL, SEL, LM and PT indicated that the overall porpoise usage of Hong Kong waters fluctuated across different years since 2002. After a relatively stable period between 2012-15 (all within the range of 5.3-6.4 porpoises per 100 km of survey effort), the porpoise encounter rate dropped noticeably in 2016, which was similar to the low levels in 2010 and 2011 (Figure 35a). Among the four survey areas, the inconsistency in porpoise usage was even more evident, with no apparent long-term trend in any of these four areas (Figure 36). However, there appeared to be a noticeable downward trend in porpoise occurrence within SWL survey area during 2013-16 (Figure 36).

To take into the account of the potential frequent movements across SEL, SWL and LM in winter and spring months, the data from these three areas were pooled to calculate the annual porpoise encounter rate in southern waters of Hong Kong collectively for another examination of such temporal trend in the past decade. In 2016, porpoise usage in the southern waters of Hong Kong has further diminished, after a noticeable drop in 2015 (Figure 35b). The steady declining trend of porpoise usage in recent years should be closely monitored, as the southern waters have long served as important habitats for the porpoises in Hong Kong waters. Such monitoring is particularly important in light of several pending infrastructure projects (e.g. reclamation for Integrated Waste Management Facilities at Shek Kwu Chau, offshore LNG terminal to the east of Soko Islands) as well as the on-going threat of high-speed ferry traffic in South Lantau region that may affect the porpoise usage in these waters.

5.6. Density and Abundance

5.6.1. Estimates of dolphin density and abundance in 2016

The densities and abundance of Chinese White Dolphins were estimated for NEL, NWL, WL and SWL survey areas using the line-transect analysis method, following similar approach as in previous years of dolphin monitoring in Hong Kong (e.g. Hung 2015, 2016). The annual estimates deduced from the 2016 monitoring data can be used to assess the long-term temporal trend in dolphin occurrence in Hong Kong. Only effort and sighting data collected from the four areas under Beaufort 0-3 conditions were used in the analysis, which included 7,580.4 km of survey effort and 267 dolphin groups for the density and abundance estimation in 2016.

Among the four survey areas, WL recorded the highest dolphin density in 2016, with 96.49 individuals/100 km^2, which was 7-8 times higher than the ones in NWL and SWL. But such figure was considerably lower than the ones in 2014-15 as well as the earlier years from 2003-10. SWL recorded the second highest dolphin density among the four areas, with 12.94 individuals/100 km^2, and such figure has dropped dramatically from the previous two years (39.58 in 2014 and 37.05 in 2015), and was the lowest since 2010 when annual estimates were generated annually for this survey area. The density estimate in NWL in 2016 (11.53 individuals/100 km^2) was slightly lower than the one in SWL, and was the second lowest since 2001 (the lowest was previously recorded in 2015). As in 2015, estimating dolphin density and abundance for NEL in 2016 was not feasible, since there was only one dolphin sighted off-effort there for the entire year.

In 2016, the abundance estimates of Chinese White Dolphins were 27, 11 and 9 dolphins respectively in WL, NWL and SWL survey areas (and zero in NEL survey area with no on-effort dolphin sighting made during 1,850.3 km of survey effort), with a combined estimate of 47 dolphins from the four areas (Figure 37). Notably, despite the smaller sample sizes of dolphin groups in SWL and NWL survey areas, the coefficient of variations (CVs) remained fairly low for the 2016 estimates in WL (18%), SWL (22%) and NWL (24%), and therefore the resulted estimates for the year should be reliable.

5.6.2. Temporal trends in dolphin abundance

Temporal trends of annual dolphin abundance in NWL and NEL (2001-16), SWL (2002-16) as well as WL (2003-16) were further examined, where consistent amount of survey effort (at least 500 km of annual survey effort) has been conducted in these four areas of major dolphin occurrence. For SWL, temporal trend of annual estimates was only examined for the recent years (2010-16) but not for a longer period, as consistent survey effort (at least 500 km of survey effort per year) was not collected annually before 2010). Alternatively, biennial estimates were deduced in SWL separately for 2002-15 to examine the overall temporal trend in dolphin abundance over a longer period.

For the biennial estimates in SWL, the temporal trend first showed a marked decline from 30 dolphins in 2002/03 to only six dolphins in 2006/07 (Figure 38a). Since then, the dolphin numbers remained at a lower level of 11-12 dolphins in the three subsequent biennial periods (i.e. 2008/09, 2010/11 and 2012/13), before a noticeable rebound to a higher level of 25 dolphins in 2014/15 (Figure 38a). On the other hand, the annual estimates in SWL during 2010-16 showed that they first fluctuated at a lower level during the first four years in 2010-13, but have significantly increased to 24-26 dolphins in 2014-15 (Figure 38b). After that, the annual estimate dropped to a much lower level in 2016 with only nine dolphins in SWL waters, which was also the lowest during the seven-year period (Figure 38b). It should be cautioned that the CVs of the annual estimates in 2010 (67%) and 2012 (54%) were both fairly high, while the other annual estimates should be more reliable for most years that were within the range of 22-40% for the associated CVs.

In WL, individual abundance has steadily decreased from 54 dolphins in 2007 to only 17 dolphins in 2012 (Figure 39). In subsequent years, the abundance estimate has rebounded to 23 dolphins in 2013 and 36 dolphins in 2014, followed by another steady decline in 2015 and 2016 with 31 and 27 dolphins respectively (Figure 39).

Dolphin abundance in the North Lantau region showed an even more pronounced decline in the past 16 years. In NWL, dolphin abundance steadily dropped from the highest in 2003 (84 dolphins) to the lowest in 2015-16 (10-11 dolphins), with an 87-88% decline in the past decade (Figure 39). Such decline has intensified during the past few years, dropping form 40 dolphins in 2012 to only 10-11 dolphins in 2015-16, with over 70% decline just within the past four years (Figure 39). In NEL, the decline was even more appalling, dropping from the highest in 2001 (20 dolphins) to the lowest in 2014 (one dolphin), and then virtually zero in 2015 and 2016 (Figure 39). The most noticeable decline in this area occurred between 2011 and 2014, with a 91% drop in just three years. When combining NEL and NWL estimates to examine the trend in dolphin abundance for the entire North Lantau region, it has been on a rapid decline from 102 dolphins in 2003 to only 11 dolphins in 2016, with a 90% drop during 2003-16.

Using the linear regression models, the test statistics for hypotheses $H_0: b=0$ vs. $H_1: b<0$ in the respective four areas were found to be as follow:

- SWL (2002-16): for the biennial estimates in 2002-15 (seven point estimates), the test statistic for the hypotheses was -0.5723 whose p-value was 0.2959 >5%, and therefore the hypothesis H_0 is not rejected at 5% level of significance with the biennial abundance data of dolphins in SWL not possessing a significant downward sloping trend. For the annual estimates in 2010-16, the test statistic for the hypotheses was 0.7358 whose p-value was 0.7571 >5%, and therefore the hypothesis H_0 is not rejected at 5% level of significance with the annual abundance data of dolphins in SWL also not possessing a significant downward sloping trend.

- WL (2003-16): the test statistic for the hypotheses was -4.7457 whose *p*-value was 0.0002 <5%. Therefore, the hypothesis H_0 is rejected at 5% level of significance, and the abundance data of dolphin in WL was concluded to possess a significant downward sloping trend.

- NWL (2001-16): the test statistic for the hypotheses was -11.4632 whose *p*-value was ≈ 0.0000 <5%. Therefore, the hypothesis H_0 is rejected at 5% level of significance, and the abundance data of dolphin in NWL was concluded to possess a significant downward sloping trend.

- NEL (2001-16): the test statistic for they hypotheses was -7.3079 whose *p*-value was ≈ 0.0000 <5%. Therefore, the hypothesis H_0 is rejected at 5% level of significance, and the abundance data of dolphin in NEL was also concluded to possess a significant downward sloping trend.

- Combined estimates from SWL, WL, NWL and NEL (2003-16): the test statistic for the hypotheses was -8.7039 whose *p*-value was ≈ 0.0000 <5%. Therefore, the hypothesis H_0 is rejected at 5% level of significance, and the combined abundance data of dolphin from SWL, WL, NWL and NEL was concluded to possess a significant downward sloping trend.

In summary, significant declines in dolphin abundance were detected in each of the three survey areas in NEL, NWL and WL in the past decade. Even though a significant trend was not detected in SWL since 2002, there was a marked decline in 2016 after a prominent increase in dolphin numbers in 2014 and 2015. When the abundance estimates of SWL were considered together with the other three areas collectively, there was a significant downward trend in overall dolphin abundance to the lowest point in 2016, which was largely attributed by the dramatic decline in dolphin numbers in the North Lantau region in recent years and also in the WL and SWL waters in 2016. To elucidate the reasons behind the dramatic decline in dolphin abundance in Hong Kong waters in the past decade, the occurrence of individual dolphins including their temporal changes in range use among different survey areas in recent years will also be closely examined in Section 5.7.

5.7. Range Use, Residency and Movement Patterns

5.7.1. Individual range use, residency pattern and core area use

In order to examine individual range use of Chinese White Dolphins, the 95% kernel range of 153 individuals that occurred in 2016 through photo-identification works were deduced using the fixed kernel method, and their ranging patterns are shown in Appendix VI. In addition, 167 individual dolphins that were sighted ≥15 times and occurred during the past three years of 2014-16 were further examined for their range use and residency patterns (Table 1).

Among these 167 individuals, all except one (NL286) have occurred in WL in the past, while the majority of individuals have also occurred in NWL (77.2%) and SWL (65.3%), and to a smaller extent in NEL (28.7%) and DB (18.6%) (Table 1). On the contrary, only 13 and two individual dolphins have been sighted in SEL or EL survey area respectively as part of their historical range. Moreover, 65.9% of these 167 individuals occupied range that spanned from Hong Kong across the border to Mainland waters (Table 1), indicating the frequent cross-boundary movements of many individual dolphins identified in Hong Kong waters.

The residency patterns of 153 individuals were assessed by examining their annual and monthly occurrences in Hong Kong, while the other 14 individuals were identified and re-sighted only in the past few years, and therefore their annual occurrence could not be properly and reliably assessed. Overall, 97 and 49 individuals were identified as year-round and seasonal residents respectively, and seven individuals (NL247, NL280, WL66, WL132, WL171, WL178 and WL214) were identified as seasonal visitors. Over 95% of the 153 individuals were considered residents in Hong Kong, as they have been sighted consistently in the past decade, or at least five years in a row. However, the proportion of visitors (less than 5%) that utilized Hong Kong waters could be seriously underestimated, as these visitors would have infrequently utilized Hong Kong waters, and it will be harder for them to reach the minimum requirement on the number of re-sightings required for this analysis. Moreover, based on the monthly occurrences of these 153 individuals, 36.6% of these examined individuals only occurred in Hong Kong during certain months of the year, while the rest occurred here year-round (Table 1).

In addition to their residency patterns, the 167 individuals were classified into the two social clusters that occurred regularly in Hong Kong (see Dungan et al. 2012), based on their overall range use at 95% UD level as well as core area use at 50% UD and 25% UD levels. Results indicated that 48 individuals (28.7%) and 100 individuals (59.9%) belonged to the northern and southern social clusters respectively, while another 19 individuals spanned their range use evenly across North and West Lantau waters with frequent occurrences in both waters in the past (Table 1).

From the core area analysis, four major core areas of dolphin activities were located around Lung Kwu Chau, the Brothers Islands, in SWL waters, and along the west coast of Lantau, with the latter further subdivided into Tai O, Peaked Hill and Fan Lau (Table 1). Among the 167 individuals, 65 and 56 individuals occupied Lung Kwu Chau as their 50% and 25% UD core areas respectively, while 15 and 12 individuals occupied the Brothers Islands as their 50% and 25% UD core areas respectively (Table 1). The majority of these individuals that utilized Lung Kwu Chau and the Brothers Islands as their core areas belonged to the northern social cluster. On the contrary, 123 and 113 individuals occupied along the west coast of Lantau as their 50% UD and 25% UD core areas respectively, with the majority of them belonged to the southern social clusters (Table 1). Among the 113 individuals that occupied WL waters as their 25% UD core areas, 50%, 49% and 47% of them primarily utilized Tai O, Peaked Hill and Fan Lau respectively within West Lantau waters. As there has been a recent surge of individuals expanding or shifting their range use into SWL waters, there were also ten and eight individuals that have utilized SWL waters as their 50% and 25% UD core areas respectively (Table 1).

5.7.2. Individual movement pattern

By combining all photo-identification data collected through the present monitoring study and other studies, movement patterns of individual dolphins within Hong Kong territorial waters in 2016-17 were broadly examined. During the 12-month period, 208 individuals were re-sighted a total of 1,134 times, with 159 individuals being sighted more than once (i.e. occurred at more than one location).

By examining their movement patterns between re-sightings, it was observed that 111 individuals moved extensively across different survey areas around Lantau in 2016-17. For example, 81 individuals were re-sighted in both SWL and WL survey areas, while 50 individuals occurred across NWL and WL survey areas. Moreover, 20 individuals occurred in NWL, WL and SWL survey areas, covering extensive range during the 12-month monitoring period. On the contrary, as no sighting was made in NEL during the 2016-17 monitoring period, there was no individual movement covering this once-important habitat for many individual dolphins in the past.

Despite the extensive amount of photo-identification data being collected from different surveys during 2016-17, a significant portion of individual dolphins were sighted repeatedly within just a single survey area only, but did not range into neighbouring areas. For example, 29 individuals occurred exclusively in WL survey area, while another 14 individuals were only re-sighted in NWL waters during the 12-month study period. Undoubtedly, some of these animals would have ventured across the territorial border and utilized the Mainland waters as part of their ranges (see Hung 2016), but their restricted movements within Hong Kong waters could still be a concern, as this could be related to potential obstruction of movements across different survey areas as a result of human activities (e.g. high-speed ferry traffic) or infrastructure project (e.g. reclamation, bridge construction).

The temporal trend in individual movement patterns across different survey areas was examined for recent monitoring periods, in order to provide any insight on whether their intensity of movements has changed due to various anthropogenic factors. In the past, dolphins moved regularly and frequently between NEL and NWL, utilizing the waters to the north of the airport as the traveling corridor to gain access to the Sha Chau and Lung Kwu Chau Marine Park as well as the Brothers Islands as their core areas (see Hung 2008, 2014). However, such movements have greatly diminished in the past six monitoring periods, with 50 individual dolphins engaged in such movement in 2011-12 down to zero in 2016-17 (Figure 40). Such dramatic decline coincided with the dramatic decline in dolphin abundance and overall usage in North Lantau waters during the same period (see Sections 5.3.1 and 5.6.2). As such movements between the two areas was facilitated by an important traveling corridor to the north of the airport based on results from focal follow study and theodolite tracking works (Hung 2014), these movements have likely been disrupted by the increased amount of vessel traffic originated from the Sky Pier, the commencement of HKBCF reclamation works since the second quarter of 2012, and the recent commencement of the third runway expansion works in mid-2016 that involves 650 hectares of reclamation with intense marine traffic of works vessels.

Moreover, after a slight rebound in movements of individual dolphins between NWL and WL survey areas from 2012-14 to 2014-15, there was a marked decline in number of individuals that moved between these two areas in 2015-16, but such level has rebounded slightly in 2016-17 (Figure 40). Such changes in level of individual movements have important implications, as the movements of individual dolphins between NWL and WL are facilitated by an important traveling corridor to the west of the airport and near Sham Wat based on previous focal follow study and shore-based theodolite tracking works (Hung 2014). It is likely that such movement has been significantly affected by the HKLR09 construction works as well as the permanent physical structures of the bridge piers. Shore-based theodolite tracking at Sham Wat Station is critical and should be continued to examine the intensity of individual movements across NWL and WL waters, in order to determine whether there is any recovery in the north-south movement across the bridge alignment in the near future.

In 2016-17, the intensity of movements between WL and SWL survey areas remained high, after a notable increase in the past six monitoring periods (Figure 40). The frequent movements of individuals between these two areas in the recent monitoring periods corresponded well with the significant increase in dolphin occurrence in SWL waters in the past several years. From the examination of individual range shifts (see Section 5.7.3), it is apparent that many individuals have expanded or shifted their range use into SWL waters in recent years. Such trend should be continuously monitored, as it would shed light on whether it is related to the response to anthropogenic impacts by some individual dolphins. More importantly, it should be examined whether such increased utilization of SWL waters would increase the chance of these individuals of getting hit by a high-speed ferry within the South Lantau Vessel Fairway.

5.7.3. Temporal changes in range use of individual dolphins

As in the previous two monitoring periods, the examination on temporal changes in range use by individual dolphins continued for the present study. This included 114 individuals that have regularly occurred in Hong Kong waters among the five periods of 2011-12 (baseline period before commencement of HZMB construction), 2013, 2014, 2015 and 2016, in order to gain a better understanding on the underlying dynamics behind the trends in dolphin abundance in different parts of Lantau waters as examined in Section 5.6.2.

Among these 114 individuals, 59 and 55 of them were members of the northern and southern social clusters respectively. As the individual range use patterns from the two social clusters can differ significantly (Dungan et al. 2012), with the northern ones focused their range use primarily around the Brothers Islands as well as the Sha Chau and Lung Kwu Chau Marine Park, while the southern ones primarily along the west coast of Lantau, their changes in range use among the five time periods were examined separately. Several parameters were examined for such temporal changes in individual range use, which included the changes in level of utilization, changes in range use including expansion, shrinkage, shifts (either partial or complete shift to a nearby area) and reversal of shifts, and how such shifts have occurred from one area to another. For the southern social cluster's individuals, further examination would also be made to determine whether the individuals have shifted away from the HKLR09 alignment (i.e. west of the airport).

Among the 59 individuals from the northern social cluster, more than two-thirds of them (41 individuals) have utilized Lantau waters progressively less since 2011 (see NL284 as an example in Figure 41). In contrast, 35 of them (59%) have utilized WL waters more during the five periods, with a proportion of these (13 individuals) starting to utilize SWL waters more in 2015-16. Furthermore, the less frequent use of Lantau waters also resulted in range shrinkage for 54% of these individuals, in contrast to a range expansion by only 10% of these individuals.

The increased utilization of WL and SWL waters have also resulted in range shifts by many individual dolphins from the northern social cluster. In total, 44 of the 59 northern cluster individuals have shifted their range since 2011, with the majority of them (41 individuals) shifted their ranges away from NEL waters (see NL261 as an example in Figure 42). Such shifts have also resulted in a virtual absence of dolphin occurrence in NEL waters in 2015-16. Besides the range shifts away from NEL waters, 28 individuals have shifted part or all of their ranges from North Lantau waters to WL waters, and eight of them even shifted their range use to include SWL waters (see NL120 as an example in Figure 43). Notably, such individual range shifts from NL to WL waters have slightly intensified in 2016 when compared to 2015, with three more individuals recorded such shifts in 2016. On the contrary, after shifting their range use from NL to WL in previous years, five individuals (NL103, NL145, NL262, NL264 and NL288) have reversed such shifts and occurred only in NWL waters in 2016 (see NL145 as an example in Figure 44).

The above results indicated that since the construction of HZMB commenced in 2012, individual dolphins have dramatically reduced their usage in NEL waters by shifting their ranges to avoid this area. Some of them also started to extend their range use to WL and even SWL waters, and at the same time reduced their range use in NWL water in the past few years. This has likely contributed to the dramatic decline in dolphin abundance and overall occurrence in both NEL and NWL waters since 2011 as examined in previous sections. However, there appeared to be a reverse of such range shifts for some individuals, and it remained to be seen whether such reverse would become more prevalent for more individuals in the coming years, in light of the increasing level of disturbances from the third runway construction activities.

The observation on individual range shifts is only one of the scenarios behind the decline in dolphin abundance in North Lantau waters, as a good number of individuals have also disappeared from Hong Kong waters at the same time, possibly moving to Mainland waters temporarily or permanently (see Hung 2016). Some individuals could also have died as a result of the existing and additional threats. Moreover, a number of individuals have confined their range use in NWL, and these individuals may have also ventured into Mainland waters more frequently with reduced usage of North Lantau waters. In summary, from the perspective of individual range use, the reduction in dolphin abundance in North Lantau waters is partly related to the virtual absence of individual dolphins in NEL waters and their reduced usage of NWL waters with their ranges shifting and extending into WL and SWL waters as well as into Mainland waters.

On the other hand, for the 55 individuals from the southern social cluster, nine individuals have progressively reduced their utilization of their ranges in Lantau waters since 2011, while six dolphins have increased their usage of Hong Kong waters at the same time (see WL94 as an example in Figure 45). During the same period, approximately the same proportions of individuals have either expanded (32%) or shrunk (29%) their ranges in Hong Kong waters, while 14 individuals (24%) did not show any apparent change in range use since 2011. Moreover, 28 of the 55 individuals have shown clear avoidance of the HKLR09 alignment in the past several years with their range shifting to further south of the bridge alignment (see WL15 as an example in Figure 46). On the contrary, five individuals (NL247, NL293, WL79, WL124 and WL142) did not show such avoidance behaviour at all, and still ranged across the bridge alignment in recent years.

Furthermore, more than half of these individuals from the southern social cluster (50.8%) have utilized SWL progressively more in recent years, and 14 individuals have actually shown clear range shifts from WL to SWL waters (as compared to eight individuals in the previous year of monitoring; see Hung 2016) as a result of increased utilization of SWL waters (see WL123 as an example in Figure 47). However, it is unclear whether such range shifts are related to the avoidance of the bridge alignment, or more competition of fishery resources with more individuals from the northern social cluster shifting their ranges to WL and SWL waters in recent years.

Notably, a number of these 55 frequently-sighted individuals have gradually disappeared from Hong Kong waters in the past few years. In 2014, three individuals have already disappeared, and that number has increased to 14 individuals in 2015. In 2016, 26 individuals (or nearly half of the 55 individuals) have already disappeared from Hong Kong waters, with 15 and 11 individuals from the northern and southern social clusters respectively. It is uncertain whether they have permanently shifted away from Hong Kong waters, or have already died in the past 2-3 years.

From the examination of the temporal changes in range use among the southern social cluster individuals, it is apparent that there were fewer changes in their range use than their counterpart from the northern social cluster, with most of them continuing to utilize WL waters at a high level as before the bridge construction. Nevertheless, these individuals have ventured less frequently into North Lantau waters across the HKLR alignment, while spending progressively more time in SWL waters, with some individuals even shifting their range use there. It is likely that individuals from the southern social cluster have been more affected by the HKLR construction with the presence of the physical structures of the bridge piers. The partial obstruction by the bridge alignment for southern social cluster individuals to move between WL and NWL waters would further reduce the number of dolphins utilizing NWL waters, which coincided with the dramatic decline in dolphin numbers there. With the additional individuals from both social clusters starting to utilize SWL waters more, this would also explain why there has been a strong surge in dolphin numbers in SWL in 2014 and 2015. However, there was a noticeable decline in dolphin number in SWL in 2016 (see Section 5.6.2). It remained to be seen whether individual dolphins have started to utilize SWL waters less and move somewhere else.

To further understand the correlation between the extent of range shifts by individual dolphins in Hong Kong and the trends in dolphin abundance among different survey areas, the level of utilization among different areas were broadly examined quantitatively for individuals that have occurred regularly in Lantau waters during the past decade. The candidates for such examination included 94 individuals that were re-sighted at least 30 times during on-effort surveys since 2003, which included 52 members from the northern social cluster and 42 members from the southern social cluster. Notably, only individual re-sightings made during on-effort survey effort were included in this analysis, as such re-sightings can be further normalized by the amount of survey effort collected in the respective year and survey area, since disproportionate amounts of survey effort across years and areas could affect the probability of individuals being re-sighted through photo-identification works during on-effort surveys.

To calculate the individual re-sighting rate, the number of on-effort re-sightings of each individual was counted for each year of 2007-2016 among each of the four main areas of dolphin occurrence (i.e. NEL, NWL, WL and SWL). Then these numbers of all 94 individuals included in the analysis were summed up for a total of individual re-sightings for each area per year, which were then further divided by the amount of survey effort for the corresponding area and year. The combined individual re-sighting rate, or the total number of re-sightings per 1,000 km of survey effort, can then be compared across different survey areas for each year, and across different years for the same survey area to examine any temporal changes in individual usage among different areas of Lantau waters.

For the 94 individuals, the combined individual re-sighting rate in NEL remained at a lower level of 28-44 (or 11-17% of the combined total from all four areas) in 2007-10, but such rate increased markedly to 92 (or 22% of the combined total) in 2011 (Figure 48). Since then, there was a dramatic decline in the re-sighting rate from 92 in 2011 to zero in 2016, with no re-sighting of individual dolphin being made during on-effort search for the entire year of 2016. For individual occurrence in NWL, there was a declining trend of individual re-sighting rate from 90 (38%) in 2007 to 57 (or 22%) in 2010 (Figure 48). Then a noticeable increase to the highest re-sighting rate of 139 (or 34% of the combined total) also occurred in 2011, followed by another steady decline to the lowest point in 2016 with a re-sighting rate of 32 (or 17% of the combined total).

In contrast, individual occurrence in WL started with a noticeable increase between 2007 and 2008, then remained at a higher level of re-sighting rate of 135-138 (or 49-55% of the combined total) in 2008-10 (Figure 48). Then a slight drop in individual occurrence occurred in 2011 and 2012, followed by a strong surge to the highest level in 2014 with a re-sighting rate of 228 (or 58% of the combined total). Since then, the re-sighting rate has steadily declined to a much lower level in 2015-2016, even though the percentages for the combined total in this area remained high as a result of the declining trend in other survey areas in the past two years (Figure 48). In SWL waters, there was a steady increase in individual re-sighing rate from 15 (or 6% of the combined total) to the highest in 2013-15 (re-sighting rate of 67-91, or 20-24% of the combined total). Then such re-sighting rate in SWL has also dropped noticeably in 2016 to a lower level (Figure 48). It should be noted that the margin of individual re-sighting rates in NWL: SWL also narrowed dramatically from 38%:8% in 2007 to 24%:19% in 2015, signaling an increase of usage in SWL but a decline in usage in NWL by individual dolphins during this period (Figure 48).

Coincidentally, the above trends of occurrence of individual dolphins among NEL, NWL, WL and SWL largely resembled the trends in dolphin abundance as examined in Section 5.6.2, indicating that the examination of re-sighting rates of individual dolphins among different areas in different years can provide valuable insights to understand the changes in dolphin abundance over time among different survey areas.

Since the primary range use of members from the northern social cluster centered around NEL and NWL in the past, while the ones from the southern social cluster centered in WL and SWL waters (Dungan et al. 2012), it would also be useful to examine the temporal trends in individual re-sighting rates among different survey areas independently for the two social clusters, with an attempt to understand the opposite trends in dolphin abundance in NEL/NWL and WL/SWL as observed in Section 5.6.2, and range shifts of individuals as observed in the first part of this section.

For the 52 individuals from the northern social cluster, the proportion of combined individual re-sighting rates in NWL remained relatively stable (40-68% of the total from the four areas) in the past ten years of 2007-16 (Figure 49). On the contrary, there was a gradual increase in individual sighting rate in NEL from 22% in 2007 to the 37% in 2011, followed by a striking decline to 0% in 2016 (Figure 49). The greatly diminished occurrence of northern cluster individuals in NEL in recent years was opposite to the trend in WL, where the proportion of individual re-sightings rates has increased evidently from 10% in 2007 and 2009 to the highest point in 2015 with 52%, followed by a slight dip in 2016 with 43% (Figure 49). At the same time, the proportion in SWL always remained at 0% in 2007-12 until it increased considerably to 10% in 2016. Such opposite trends in North Lantau region and West/Southwest Lantau region implied that many individuals from the northern social cluster diminished their usage in NEL and started to utilize WL waters (or even SWL waters to some extent) considerably more in the past three years. This corresponded well with the results from the examination of temporal range shifts of northern social cluster individuals as assessed above, with increasing numbers of individuals shifting their ranges away from NEL with some individuals starting to utilize WL and SWL waters more in recent years.

For the 32 individuals from the southern social cluster, the proportion of individual re-sightings rates in WL and SWL has changed noticeably from 2007-15, with a much large proportion of utilization taking place in WL waters in the earlier years (Figure 50). However, such percentage of margin of WL:SWL has noticeably narrowed from 87%:12% in 2008 to 61%:38% in 2015, signaling a much higher proportion of the southern social cluster individuals utilizing SWL waters in recent years (Figure 50). Notably, such trend has apparently reversed in 2016 (Figure 50), and it remained to be seen whether the decline in dolphin usage in SWL by individual dolphins in 2016 would continue in the near future. Notably, there were a slightly higher proportion of re-sightings in NWL for these southern social cluster individuals at the peak of the HZMB construction in both Mainland and Hong Kong waters during 2010-13, but this proportion dropped considerably to only 0-1% in 2014-16 (Figure 50).

It should be acknowledged that the limitation of this analysis was still restricted to 94 individuals that frequently occurred in Hong Kong waters, and may not reflect fully the overall usage of the 150-200 individuals that occurred in Hong Kong annually at various degrees. However, this analysis could still provide some quantitative measurements on the overall level of range utilization of individual dolphins and how that would affect the temporal trends in dolphin abundance across different survey areas. Such examination can also be insightful to understand how the range utilization would differ between the two social clusters as a result of different levels of anthropogenic disturbance that they experienced in their respective range.

5.8. Summary of Marine Mammal Monitoring Results in 2016

From the long-term monitoring results presented above, it is apparent that the Chinese White Dolphins residing in Hong Kong waters have been undergoing considerable changes in their distribution, habitat use, abundance and individual range use in recent years. In 2016, the dolphin sightings mainly clustered at the northwestern end of NWL waters (mainly around Lung Kwu Chau), but they have been mostly absent from the central, eastern and southwestern portions of North Lantau region. In particular, their usage at the Sha Chau and Lung Kwu Chau Marine Park was the lowest in 2016 since 2004, with an 85% decline in dolphin densities within this marine park during 2004-16. On the other hand, dolphin occurrence has slightly diminished in WL waters in 2016, and even though they occurred evenly across SWL waters, their occurrence there was generally low in 2016 as compared to 2014-15.

Dolphin abundance in Hong Kong also reached a historical low in 2016, with a combined estimate of only 47 dolphins in NEL, NWL, WL and SWL. In particular, after a significant increase in dolphin numbers in 2014-15, such number in SWL dropped to a much lower level in 2016. Similarly, dolphin numbers have rebounded in 2013-14 in WL, but such trend was reversed in 2015-16. In North Lantau region, there was a rapid decline in dolphin abundance, with a 90% drop from 2003 to 2016.

In 2016, the annual mean group size of dolphins reached the lowest in the past decade, while the percentage of young calves among all sightings was also the lowest since 2002. There was also a continuous declining trend on occurrence of feeding and socializing activities, which may signal a deterioration of habitat quality for dolphins.

At the individual level, many individuals from the northern social cluster have dramatically reduced their usage in NEL by shifting their ranges away from this area. Some of them have started to extend their range use to WL and even SWL waters, while some have also reduced their range use in NWL in the past few years. However, there appeared to be a reverse of such range shifts for several individuals. On the other hand, some individuals from the southern social cluster have ventured less frequently into North Lantau waters across the HKLR alignment, and spent progressively more time in SWL waters, with some even shifting their range use there.

Evidently, all these changes in dolphin utilization of Hong Kong waters in recent years are the consequences stemmed from the combination of existing threats (e.g. high level of vessel traffic, lack of fisheries resources) and additional threats (e.g. on-going coastal development of the HZMB and the airport’s third runway expansion). In the long run, the authority should seriously consider establishing a large marine protected area connecting the Sha Chau and Lung Kwu Chau Marine Park, the soon-to-be established Southwest Lantau Marine Park as well as the Soko Islands Marine Park, to offer a large refuge for the dolphins along the western territorial boundary of Hong Kong SAR, and to safeguard them from all these existing and future threats. Such large marine protected area in the western waters would cover most of the important and critical habitats for the dolphins as identified in Hung (2014), and thereby increase their overall capacity to cope with existing and future threats. This important conservation measure should be implemented as far as practicable, in order to ensure the continued utilization of Hong Kong waters by the Chinese White Dolphins as part of their range as stated in the government's conservation plan. Moreover, as suggested in previous monitoring reports, there should be a presumption against further reclamation around Lantau waters until a thorough assessment of cumulative impacts from different construction works is completed. A better control of marine traffic volume of high-speed ferries is also urgently needed within the dolphin habitat, to reduce and eliminate some of the disturbances they experience in their daily activities in western waters of Hong Kong.

6. SCHOOL SEMINARS AND PUBLIC AWARENESS

During the study period, HKCRP researchers continued to provide assistance to AFCD to increase public awareness on the conservation of local cetaceans. In total, HKCRP researchers delivered 13 education seminars at local primary and secondary schools regarding the conservation of Chinese White Dolphins and finless porpoises in Hong Kong.

For these school talks, a PowerPoint presentation was produced with up-to-date information on both dolphins and porpoises gained from the present long-term monitoring programme. The talks also included content such as the threats faced by local cetaceans, and conservation measures that AFCD has implemented to protect them in Hong Kong. Through this integrated approach of the long-term monitoring programme and publicity/education programme, the Hong Kong public can gain first-hand information from our HKCRP researchers. Their support will be vital to the long-term success in conservation of local cetaceans.

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Table 1. Range use (50%/25% UD core areas and sighting coverage) and residency pattern of 167 individuals with 15+ sightings and appeared since 2014.

(abbreviations: SR=Seasonal Resident; YR=Year-round Resident; SV=Seasonal Visitor; UD= Utilization Distribution; LKC = Lung Kwu Chau Marine Park; CLK= northeast corner of airport; BR= Brothers Islands; TO= Tai O; PH= Peaked Hill; FL= Fan Lau; SL= South Lantau; WL= West Lantau; DB= Deep Bay; EL= East Lantau; NEL= Notheast Lantau; NWL= Northwest Lantau; SWL= Southwest Lantau; SEL= Southeast Lantau; CH=Chinese waters; * denotes individuals that have their gender determined by biopsy sampling)

	Last				Primary	Occurrence in Survey Areas								50% UD Core Area						25% UD Core Area					
ID#	Sighted	# STG	Gender	Residency	Range	DB	EL	NEL	NWL	WL	SWL	SEL	CH	LKC	BR	TO	PH	FL	SL	LKC	BR	TO	PH	FL	SL
CH12	07/12/16	71	F?	YR	WL					√	√		√				√	√					√	√	
CH34	19/12/16	138	F	YR	NL	√		√	√	√			√	√						√					
CH38	11/11/16	90	?	YR	WL					√	√		√				√	√					√	√	
CH98	29/04/14	68	?	YR	NL	√			√	√				√						√					
CH105	20/10/15	18	F	SR	WL				√	√			√			√						√			
CH108	18/12/16	92	F	YR	WL				√	√	√		√				√	√					√	√	
CH113	16/08/16	37	F	SR	WL				√	√	√		√			√						√			
CH153	20/09/16	22		SR	WL				√	√	√		√			√						√			
EL01	22/09/16	124	M*	YR	NL		√	√	√	√	√		√		√						√				
NL12	21/09/16	33	F	SR	NL	√		√	√	√	√		√	√						√					
NL24	14/04/14	237	F	YR	NL			√	√	√			√	√	√					√	√				
NL33	09/12/16	138	F*	YR	NL			√	√	√	√			√	√						√				
NL37	26/09/16	70	?	YR	NL		√	√	√	√			√	√		√				√					
NL46	16/12/16	82	F*	YR	NL				√	√			√	√						√					
NL48	26/07/16	129	?	YR	NL	√		√	√	√				√						√					
NL49	18/01/16	59	F*	SR	NL			√	√	√	√			√		√				√					
NL80	18/03/16	33	F	SR	NL	√			√	√			√	√						√					
NL93	05/08/14	60	F	YR	NL			√	√	√				√						√					
NL98	16/12/16	162	F*	YR	NL			√	√	√	√		√	√	√					√	√				
NL103	21/09/16	56	?	SR	NL	√			√	√	√		√	√						√					
NL104	19/12/16	126	F	YR	NL	√		√	√	√			√	√						√					
NL105	12/06/15	28	?	SR	NL/WL				√	√			√	√		√				√					
NL120	16/12/16	128	F*	YR	NL			√	√	√	√		√	√	√						√				
NL123	18/12/16	157	F	YR	NL	√		√	√	√	√		√		√						√				
NL128	20/05/14	53	M*	SR	WL			√	√	√	√	√	√			√	√	√					√	√	
NL136	16/12/16	126	F*	YR	NL	√		√	√	√				√						√					
NL139	04/07/14	134	F	YR	NL			√	√	√			√	√	√						√				
NL145	05/04/16	51	F	YR	NL			√	√	√			√	√						√					
NL150	17/08/16	46	F	SR	NL	√		√	√	√	√		√	√						√					
NL156	20/10/15	46	?	YR	NL/WL				√	√	√			√		√	√					√	√		
NL165	26/09/16	90	?	YR	NL			√	√	√	√			√	√					√					
NL182	16/12/16	92	F	YR	NL	√		√	√	√				√						√					
NL188	06/07/15	84	F	YR	NL/WL			√	√	√	√			√		√	√			√		√	√		
NL191	24/06/14	67	?	YR	NL			√	√	√			√	√	√						√				
NL202	19/12/16	112	F	YR	NL	√		√	√	√			√	√						√					
NL206	25/11/16	59	F*	YR	WL				√	√	√						√	√					√	√	
NL210	29/08/16	63	?	YR	NL			√	√	√			√	√						√					
NL212	08/12/16	40	F	YR	WL				√	√	√		√			√	√					√			
NL213	26/06/15	27	?	SR	NL	√			√	√				√						√					
NL214	21/12/15	39	F?	YR	NL	√			√	√				√						√					
NL220	18/11/16	84	F	YR	NL	√		√	√	√				√						√					
NL221	21/01/14	24	F	SR	NL				√	√			√	√						√					
NL224	21/09/16	64	?	YR	NL/WL	√		√	√	√	√		√	√		√				√		√			
NL226	18/12/16	70	?	YR	NL/WL	√		√	√	√	√		√		√	√					√				
NL233	19/08/16	58	F	YR	NL	√		√	√	√			√	√						√					
NL236	29/07/16	38	?	YR	NL				√	√			√	√						√					
NL242	01/11/16	87	F*	YR	NL			√	√	√				√	√					√					
NL247	25/08/16	24	?	SV	WL				√	√			√			√	√					√	√		
NL256	22/08/16	22	F	SR	NL/WL	√			√	√			√	√		√				√					
NL259	21/09/16	73	?	YR	NL			√	√	√				√						√					
NL260	21/07/16	68	?	YR	NL/WL			√	√	√	√		√	√	√	√				√	√	√			

Table 1. (cont'd)

ID#	Last Sighted	# STG	Gender	Residency	Primary Range	Occurrence in Survey Areas								50% UD Core Area						25% UD Core Area					
						DB	EL	NEL	NWL	WL	SWL	SEL	CH	LKC	BR	TO	PH	FL	SL	LKC	BR	TO	PH	FL	SL
NL261	21/09/16	87	M?	YR	NL	√		√	√	√			√	√	√					√	√				
NL262	01/13/16	49	?	YR	NL	√			√	√	√			√						√					
NL264	21/09/16	66	F	YR	NL/WL			√	√	√			√	√		√				√					
NL269	18/11/16	35	?	SR	WL				√	√	√		√	√		√	√					√	√		
NL272	21/09/16	72	?	YR	NL	√		√	√	√	√		√	√						√					
NL278	07/10/14	20	?	SR	NL/WL				√	√	√		√	√		√				√		√			
NL279	27/02/16	22	?	SR	WL				√	√			√			√						√			
NL280	17/08/16	21	?	SV	NL	√			√	√				√						√					
NL284	18/03/16	78	?	YR	NL			√	√	√			√	√	√					√					
NL285	05/04/16	82	?	YR	NL			√	√	√				√	√					√	√				
NL286	19/12/16	84	?	YR	NL	√		√	√				√	√						√					
NL287	13/07/16	46	?	YR	NL				√	√	√		√	√						√					
NL288	21/09/16	56	?	YR	NL/WL			√	√	√			√	√		√				√		√			
NL293	07/11/16	33	?	SR	WL				√	√						√	√					√			
NL295	09/08/16	53	?	YR	NL/WL			√	√	√	√		√	√		√				√		√			
NL296	16/12/16	65	F?	YR	NL/WL			√	√	√	√		√	√			√			√					
NL299	22/08/16	26	F?	SR	WL	√			√	√	√		√			√	√					√			
NL300	28/07/15	20	?	SR	NL/WL			√	√	√				√		√				√		√			
NL301	22/08/16	24	?	SR	NL	√			√	√			√	√						√					
NL302	20/09/16	30	?	YR	NL/WL	√			√	√			√	√		√				√		√			
NL306	08/12/16	19	?	YR	WL				√	√	√	√		√		√	√	√	√				√	√	
NL307	22/09/16	21	?	YR	NL				√	√	√		√	√						√					
NL311	25/10/16	17	?	N.D.	WL				√	√	√						√	√					√	√	
NL320	18/11/16	22	?	N.D.	NL				√	√			√	√						√					
NL321	19/12/16	17	?	N.D.	NL	√			√	√			√	√						√					
NL322	09/12/16	16	?	N.D.	WL				√	√	√						√	√					√	√	
SL05	11/11/16	98	F	YR	WL					√	√		√				√	√						√	
SL27	29/06/15	52	M	YR	WL				√	√	√					√		√						√	
SL35	28/07/14	90	M	YR	WL				√	√	√	√	√			√	√	√					√	√	
SL40	08/12/16	64	F	YR	WL					√	√		√				√	√					√	√	
SL42	18/12/15	17	?	SR	NL/WL	√			√	√	√			√		√	√					√	√		
SL44	03/11/16	35	?	YR	WL					√	√					√	√						√		
SL47	08/12/16	31	?	SR	WL				√	√	√		√			√	√	√				√		√	
SL50	05/01/16	17	?	SR	WL					√	√	√						√	√						√
SL54	22/09/16	19	?	N.D.	WL					√	√					√		√	√			√			√
SL59	25/11/16	15	?	N.D.	WL					√	√		√			√	√	√				√		√	
SL60	22/12/16	16	?	N.D.	WL					√	√						√	√	√				√	√	√
WL04	30/12/15	52	F?	YR	NL/WL	√		√	√	√				√		√				√		√			
WL05	01/11/16	92	F?	YR	NL			√	√	√			√	√		√				√		√			
WL11	03/12/15	66	F*	YR	NL			√	√	√			√	√		√				√					
WL15	09/12/16	102	M*	YR	WL			√	√	√	√					√	√	√						√	
WL17	19/12/16	37	?	SR	NL/WL			√	√	√	√	√	√	√		√	√	√		√					
WL21	07/11/16	69	F	SR	WL				√	√	√		√			√	√					√	√		
WL25	04/06/14	153	F	YR	WL				√	√	√		√			√	√	√				√	√	√	
WL28	11/11/16	29	F	SR	WL				√	√	√		√			√						√			
WL29	25/10/16	42	F	SR	WL					√	√		√			√	√						√		
WL42	25/11/16	111	?	YR	WL				√	√	√		√				√	√					√	√	
WL44	11/11/16	48	F	YR	WL			√	√	√	√		√			√	√	√					√	√	
WL46	20/09/16	85	?	YR	NL/WL			√	√	√	√		√			√	√					√			
WL47	13/12/16	35	?	YR	WL	√			√	√	√	√	√			√	√	√				√	√	√	
WL50	18/06/15	77	F*	YR	WL				√	√	√		√			√	√	√				√	√	√	
WL58	26/09/16	17	?	SR	WL					√			√			√	√	√					√		
WL61	22/12/16	91	?	YR	WL				√	√	√						√	√						√	
WL62	13/12/16	81	F	YR	WL					√	√	√	√			√	√	√				√		√	
WL66	22/08/16	15	F	SV	WL					√			√			√						√			
WL68	25/10/16	52	F*	YR	WL					√	√						√	√					√		
WL69	25/11/16	88	F?	YR	WL					√	√	√	√				√	√						√	
WL72	08/12/16	99	F	YR	WL				√	√	√					√	√	√					√		
WL73	08/10/14	41	?	SR	WL					√	√					√	√	√					√	√	
WL74	02/12/16	45	?	YR	WL					√	√		√				√	√						√	
WL79	03/09/16	50	?	SR	WL				√	√			√			√						√			

Table 1. (cont'd)

ID#	Last Sighted	# STG	Gender	Residency	Primary Range	Occurrence in Survey Areas								50% UD Core Area						25% UD Core Area					
						DB	EL	NEL	NWL	WL	SWL	SEL	CH	LKC	BR	TO	PH	FL	SL	LKC	BR	TO	PH	FL	SL
WL84	12/05/14	22	F	SR	WL					√	√					√	√	√					√	√	
WL86	15/05/14	54	F	YR	WL					√	√							√						√	
WL91	08/12/16	73	?	YR	WL					√	√	√	√				√	√						√	
WL92	06/07/16	29	?	SR	WL					√	√		√			√		√				√		√	
WL93	25/11/14	39	?	YR	WL				√	√	√						√	√						√	
WL94	09/12/16	48	F	YR	WL					√	√		√					√						√	
WL98	18/05/16	27	F	SR	WL				√	√	√		√			√	√					√			
WL109	18/12/16	85	?	YR	WL				√	√	√		√			√	√	√					√		
WL114	08/07/16	59	F?	YR	WL				√	√	√		√				√	√					√	√	
WL116	01/09/16	69	?	YR	WL				√	√	√		√				√	√					√	√	
WL118	25/11/16	57	F	YR	WL					√	√		√				√	√					√		
WL120	07/05/15	28	?	SR	WL				√	√						√						√			
WL122	13/04/15	17	?	SR	WL				√	√	√		√			√						√			
WL123	13/12/16	100	F?	YR	WL				√	√	√		√				√	√						√	
WL124	16/08/16	52	F	SR	WL				√	√	√		√			√	√					√	√		
WL128	08/12/16	49	?	YR	WL					√	√		√				√	√					√	√	
WL129	22/09/16	21	F	SR	WL					√	√		√				√	√					√		
WL130	08/07/16	70	?	YR	WL				√	√	√						√	√						√	
WL131	22/12/16	113	?	YR	WL				√	√	√		√				√	√					√	√	
WL132	24/11/14	36	F?	SV	WL					√	√	√	√			√	√	√					√	√	
WL137	21/11/16	59	F	YR	WL				√	√	√		√				√	√					√		
WL142	02/12/16	63	?	YR	WL					√	√		√				√	√						√	
WL144	22/12/16	30	?	SR	WL					√	√		√				√	√					√		
WL145	18/12/16	28	F	SR	WL				√	√			√			√						√			
WL152	07/12/16	68	?	YR	WL				√	√	√						√	√					√	√	
WL153	08/10/14	23	?	YR	WL				√	√			√			√	√					√			
WL159	04/07/14	22	F	SR	WL				√	√			√			√						√			
WL165	29/02/16	62	?	YR	WL					√	√						√	√						√	
WL168	25/11/16	27	?	SR	WL					√	√		√			√	√	√				√		√	
WL170	29/06/15	28	?	SR	WL				√	√	√		√				√	√						√	
WL171	31/10/16	23	F	SV	WL					√	√					√	√	√					√	√	
WL173	08/12/16	57	?	YR	WL					√	√		√				√	√					√	√	
WL178	19/07/16	18	?	SV	WL				√	√	√	√	√			√	√					√			
WL179	11/11/16	27	F	SR	NL/WL				√	√				√		√	√	√				√	√		
WL180	08/12/16	65	F?	YR	WL					√	√		√				√	√						√	
WL189	25/05/16	17	?	SR	WL				√	√						√	√					√			
WL191	07/04/16	25	?	YR	WL				√	√			√			√	√						√		
WL193	29/07/16	35	?	YR	WL				√	√			√			√						√			
WL199	25/10/16	35	?	YR	WL				√	√	√					√	√	√					√	√	
WL207	12/09/16	21	F	SR	WL				√	√						√						√			
WL208	07/11/16	32	F	YR	WL				√	√	√					√	√	√				√	√	√	
WL210	19/07/16	23	?	SR	WL					√	√		√			√	√	√					√		
WL211	16/06/16	19	F	YR	WL					√	√						√						√		
WL214	17/03/16	18	?	SV	WL				√	√			√			√	√					√			
WL215	09/09/16	44	?	YR	WL				√	√	√		√			√	√	√					√	√	
WL216	03/09/16	27	?	SR	WL				√	√	√		√			√	√					√	√		
WL217	28/06/16	18	?	SR	WL				√	√	√					√	√					√			
WL220	25/11/16	36	?	SR	WL					√	√					√	√	√					√	√	
WL221	09/12/16	40	?	N.D.	WL				√	√	√					√	√	√	√			√		√	√
WL231	25/05/16	17	?	N.D.	WL				√	√	√		√			√	√					√	√		
WL232	28/11/16	28	?	N.D.	WL				√	√	√					√			√			√			
WL235	08/12/16	23	?	N.D.	WL				√	√	√					√	√	√	√			√	√		√
WL243	28/11/16	33	?	N.D.	WL				√	√	√	√				√			√			√			√
WL250	22/09/16	18	F	N.D.	WL					√	√	√						√	√					√	√
WL260	09/12/16	21	?	N.D.	WL					√	√		√				√		√				√		√

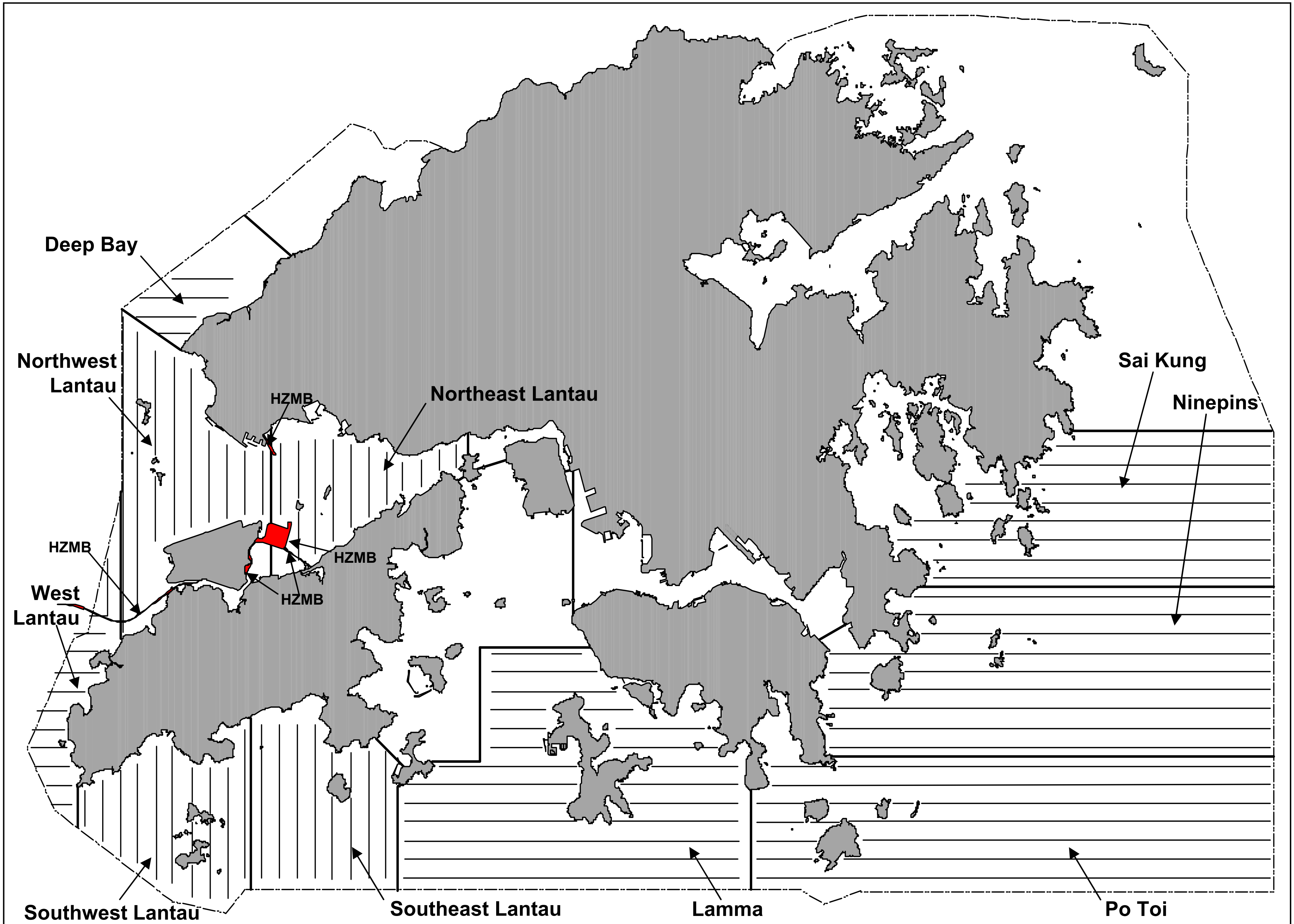


Figure 1. Ten Line-Transect Survey Areas within the Study Area chosen for the Present Monitoring Study (2016-17)

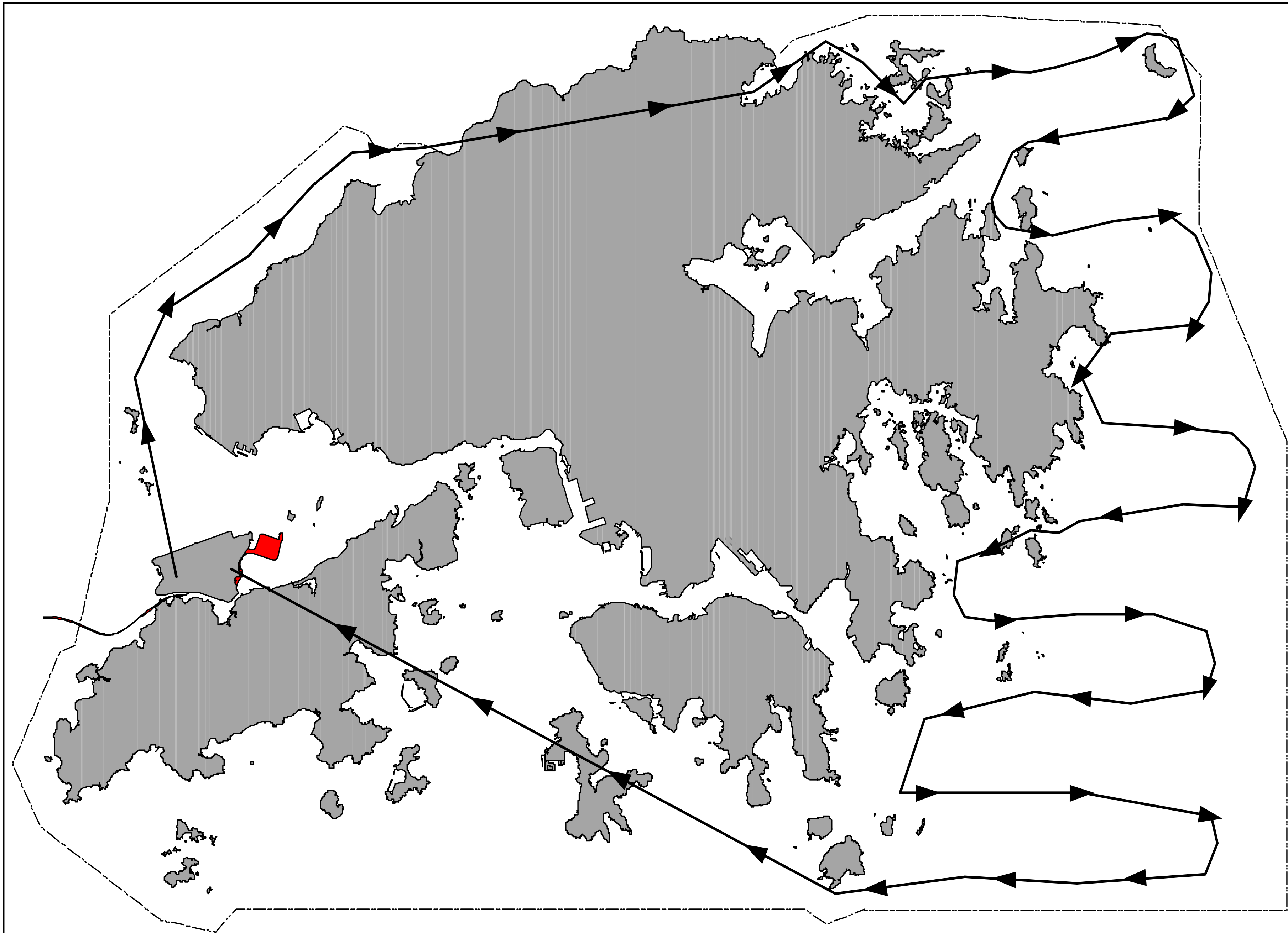


Figure 2. Survey Route for Helicopter Surveys in Eastern and Southern Waters of Hong Kong

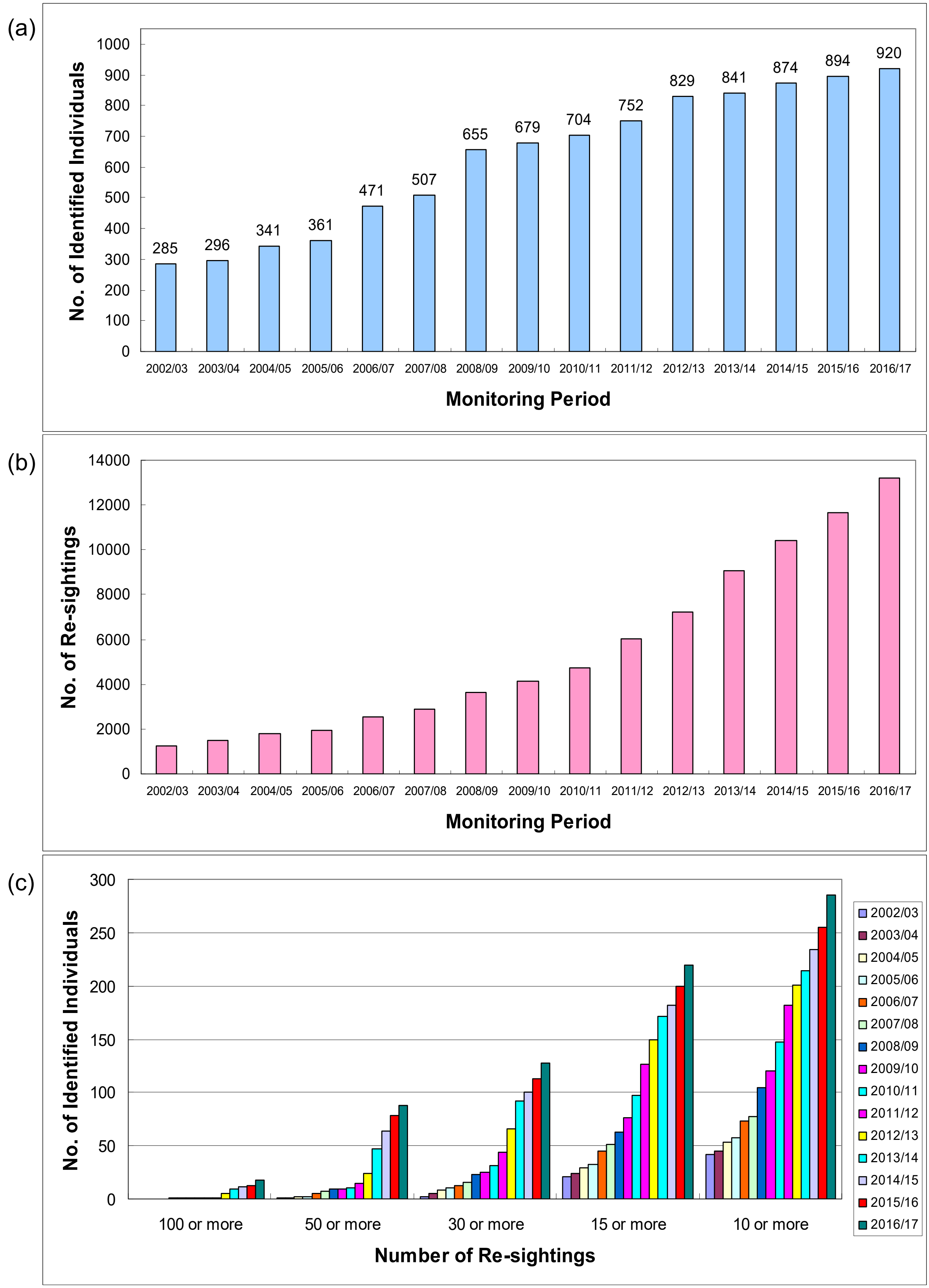


Figure 3. Temporal trends of (a) total number of identified individuals; (b) total number of re-sightings made; and (c) number of identified individuals within several categories of number of re-sightings in the past 15 monitoring periods since 2002

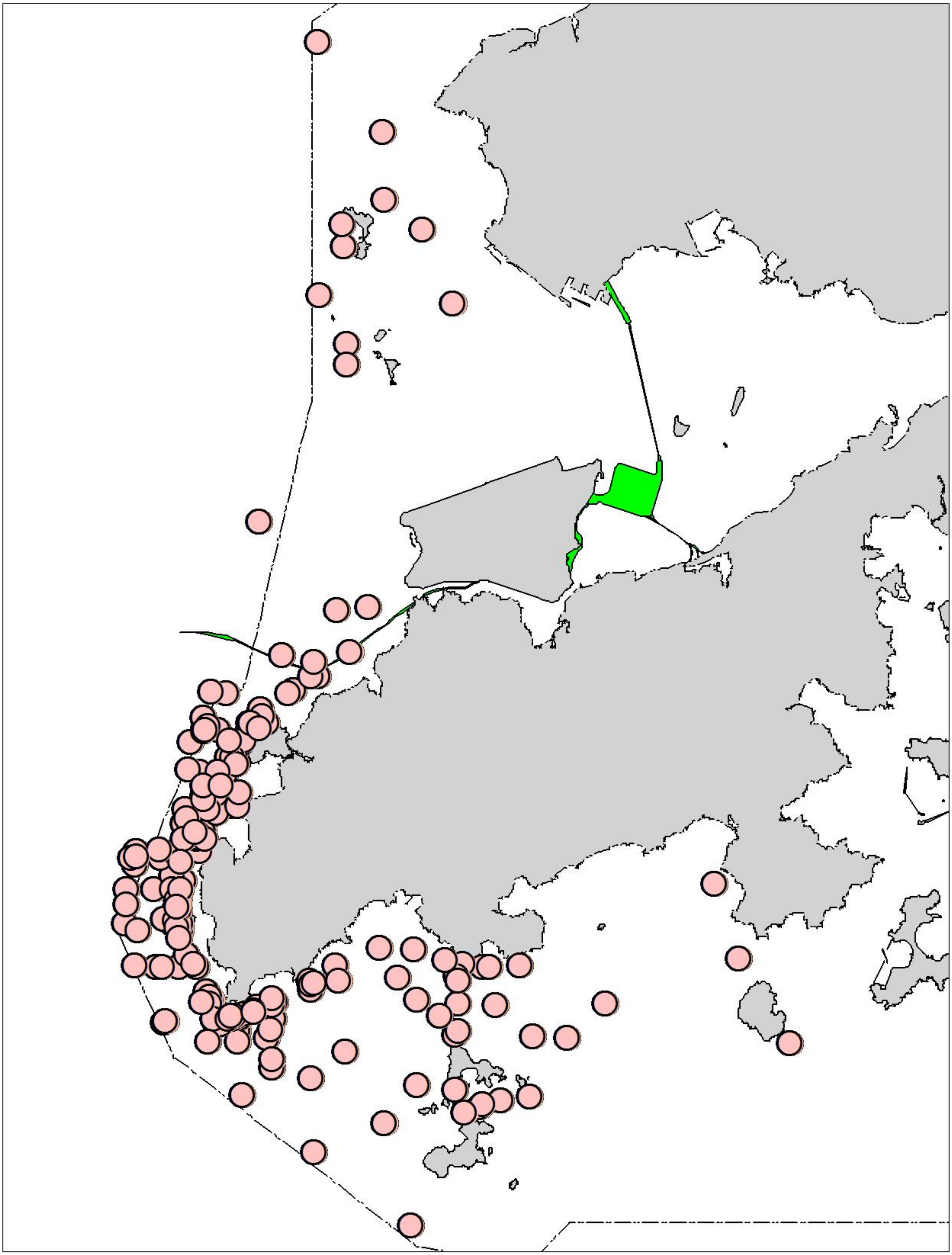


Figure 4. Distribution of CWD sightings in Hong Kong waters during AFCD monitoring surveys (April 2016 – March 2017)

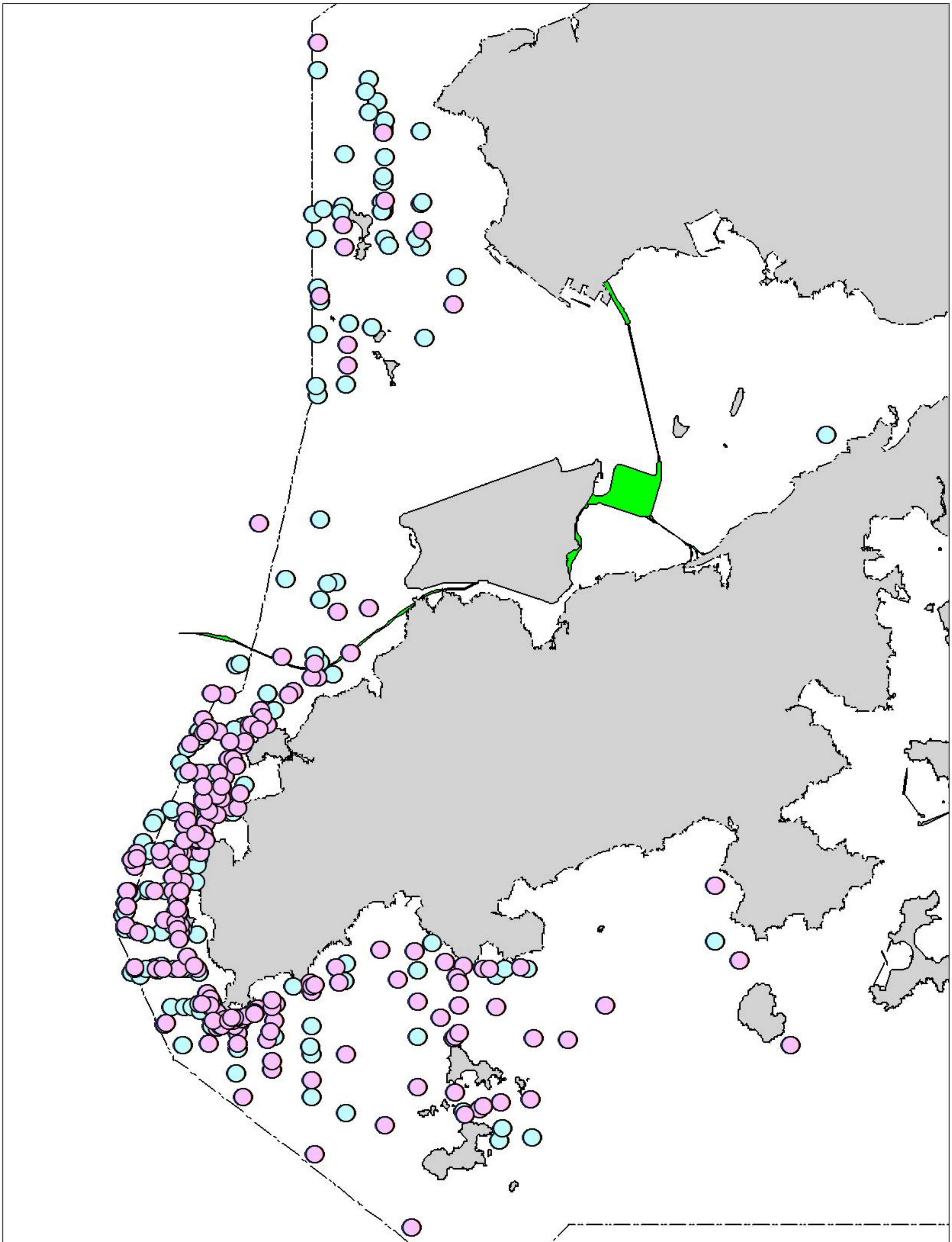


Figure 5. Distribution of all CWD sightings in Hong Kong waters in 2016-17
(purple dots: AFCD survey sightings; blue dots: HKLR survey sightings)

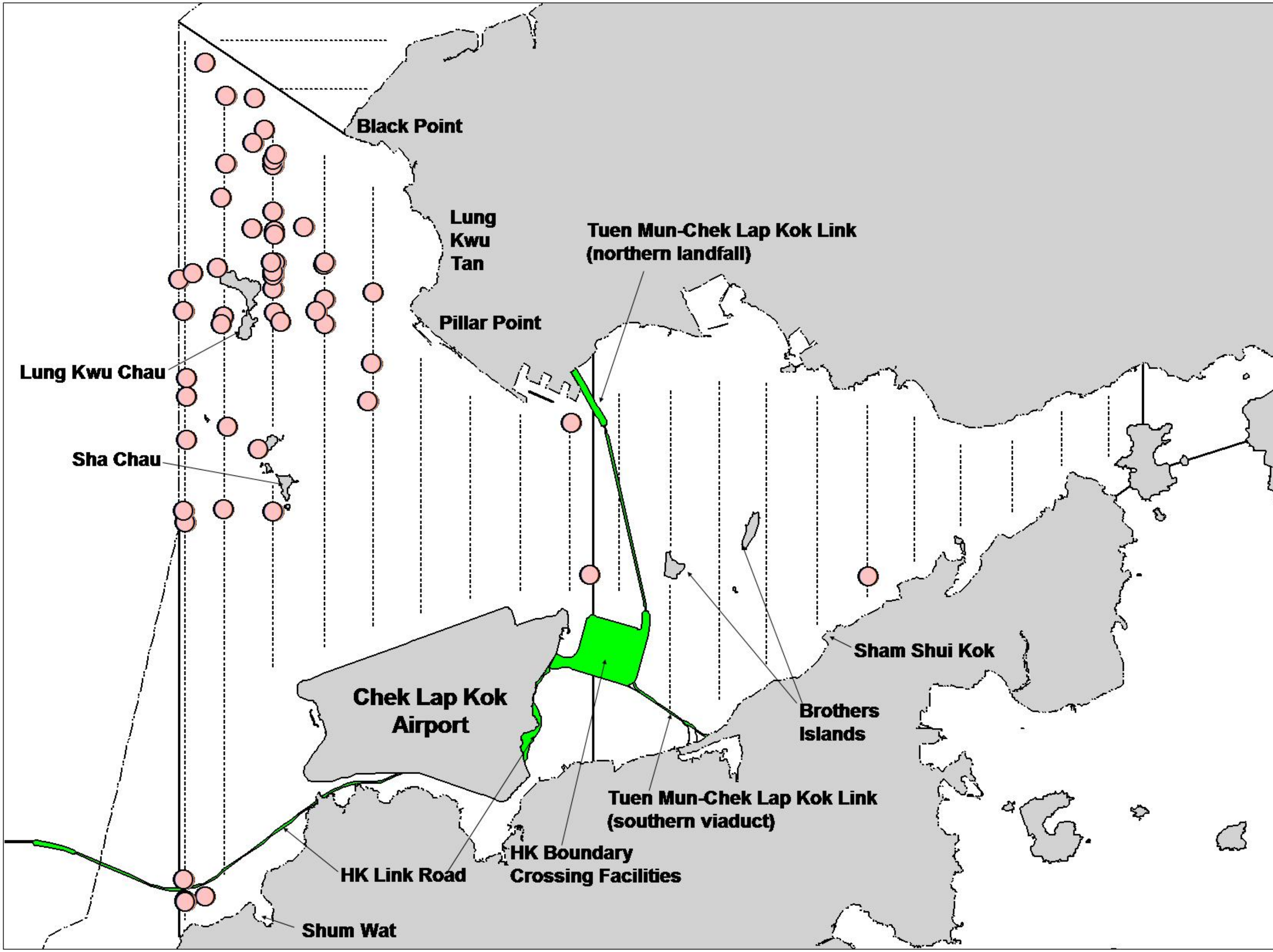


Figure 6. Distribution of Chinese white dolphin sightings in North Lantau (2016)

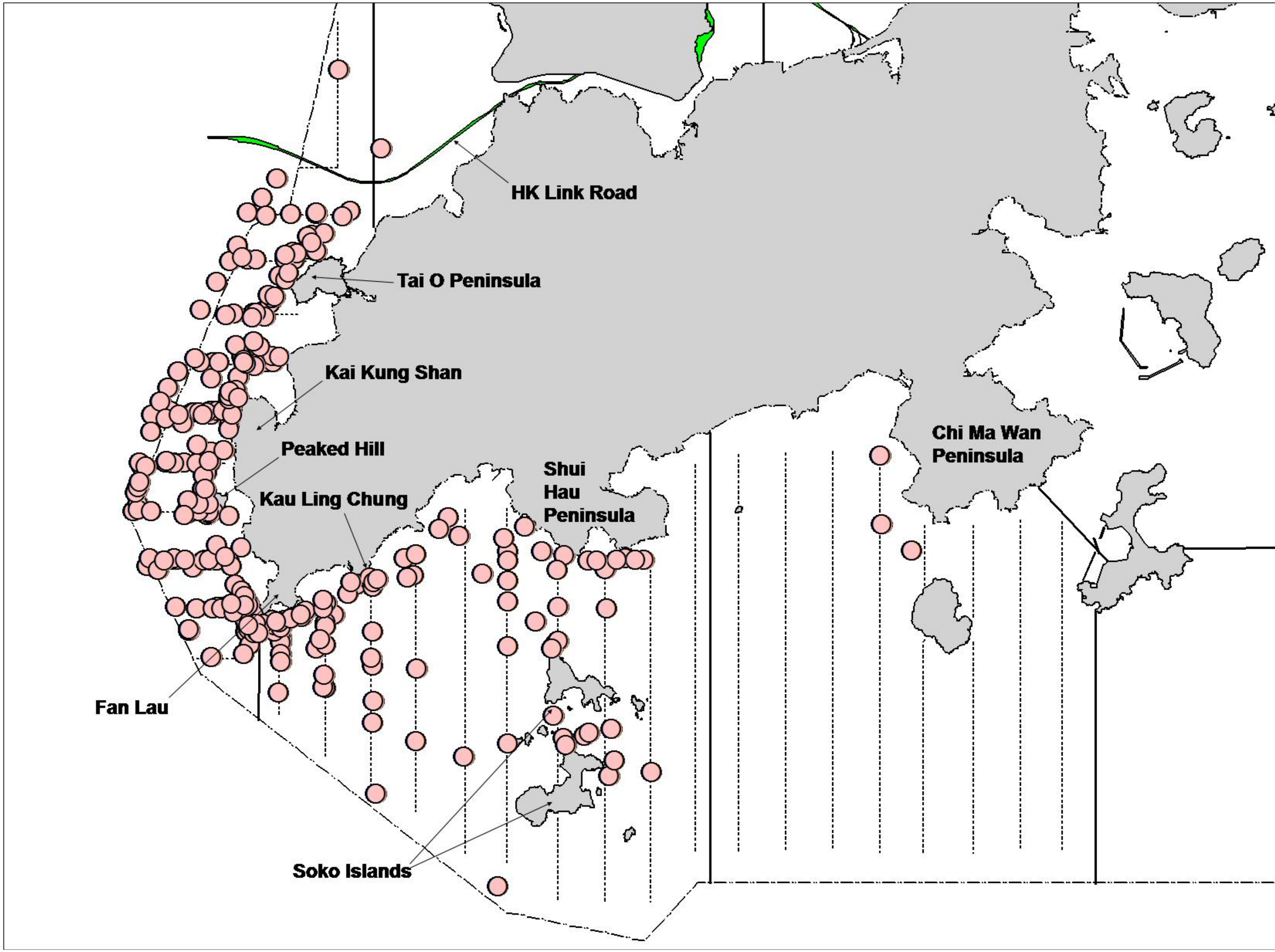


Figure 7. Distribution of Chinese white dolphin sightings in West and Southwest Lantau waters (2016)

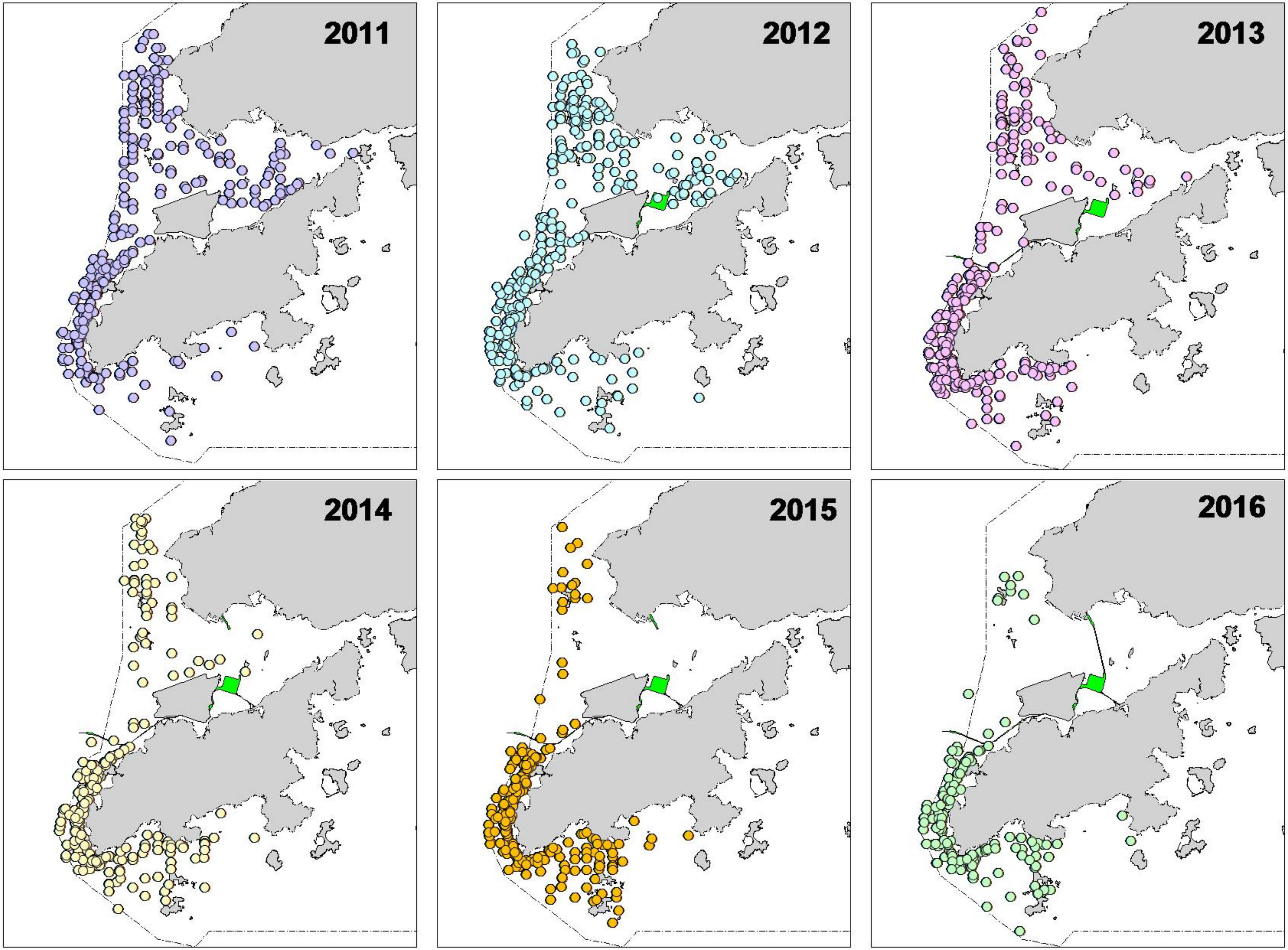


Figure 8. Comparison of dolphin distribution patterns from the past six years (2011-16)

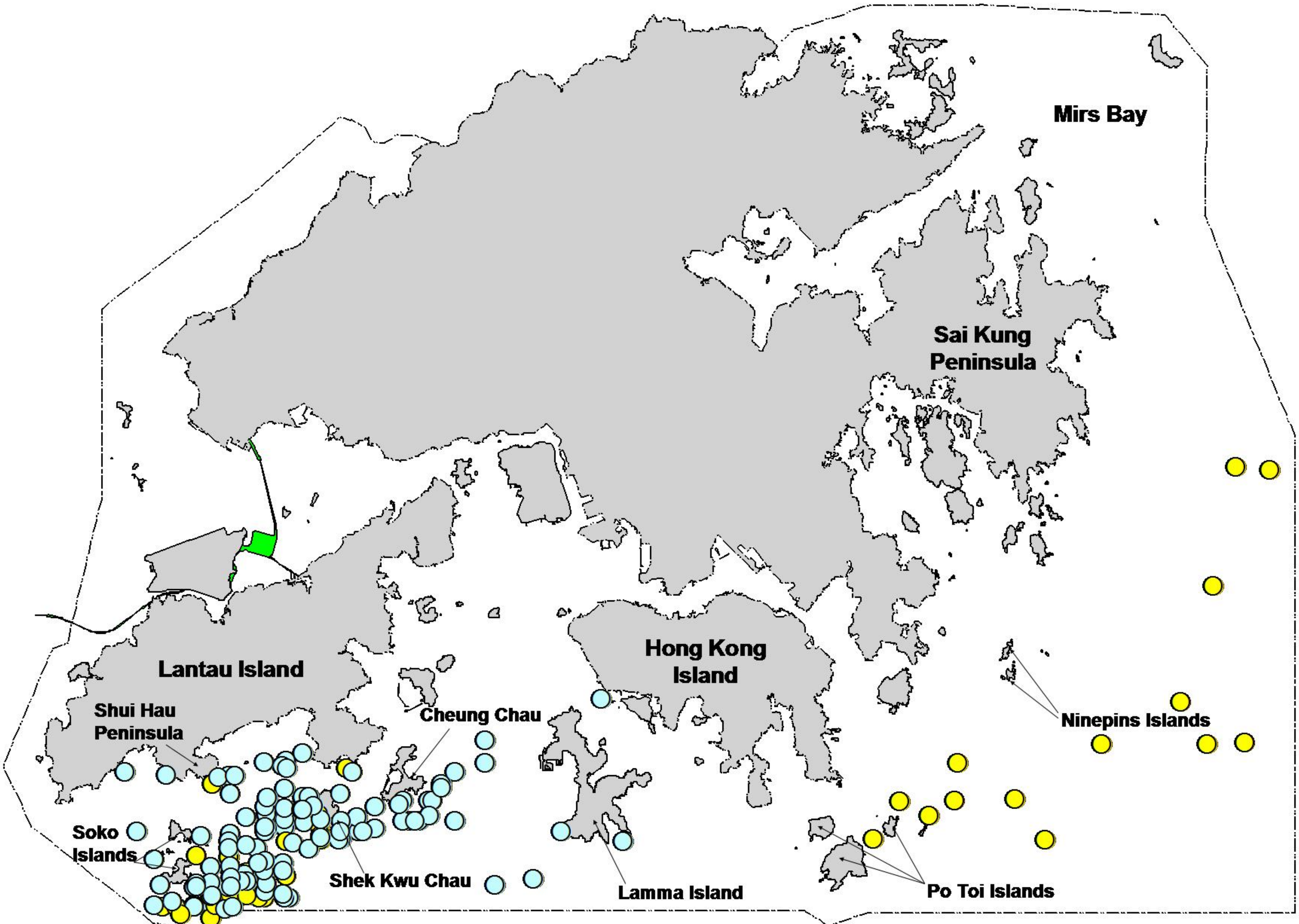


Figure 9. Distribution of finless porpoise sightings made during AFCD surveys (April 2016 – March 2017)
(yellow dots: sightings made during summer/autumn months)

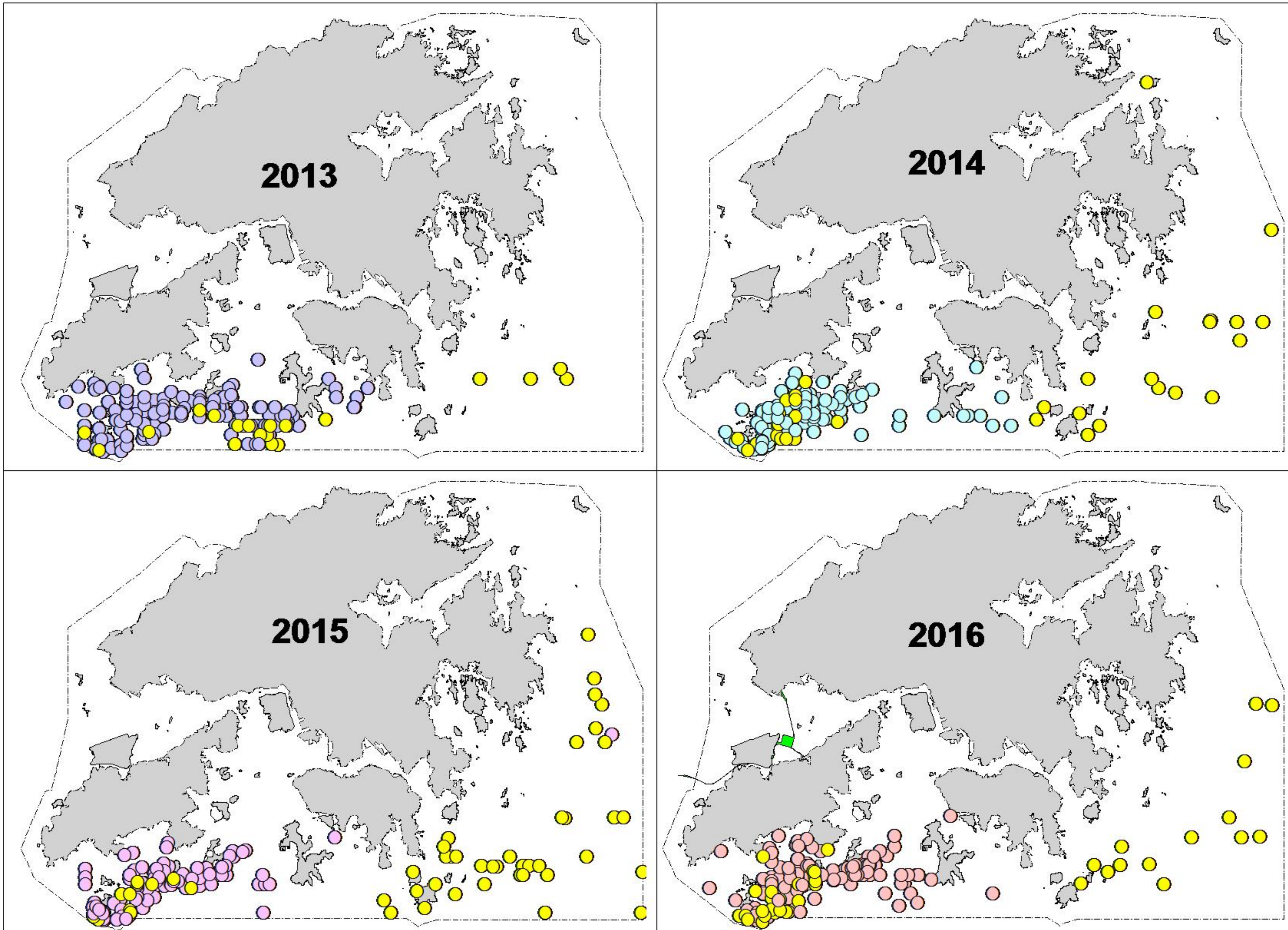


Figure 10. Comparison of annual porpoise distribution patterns from the past four years
(yellow dots: sightings made during summer/autumn months)

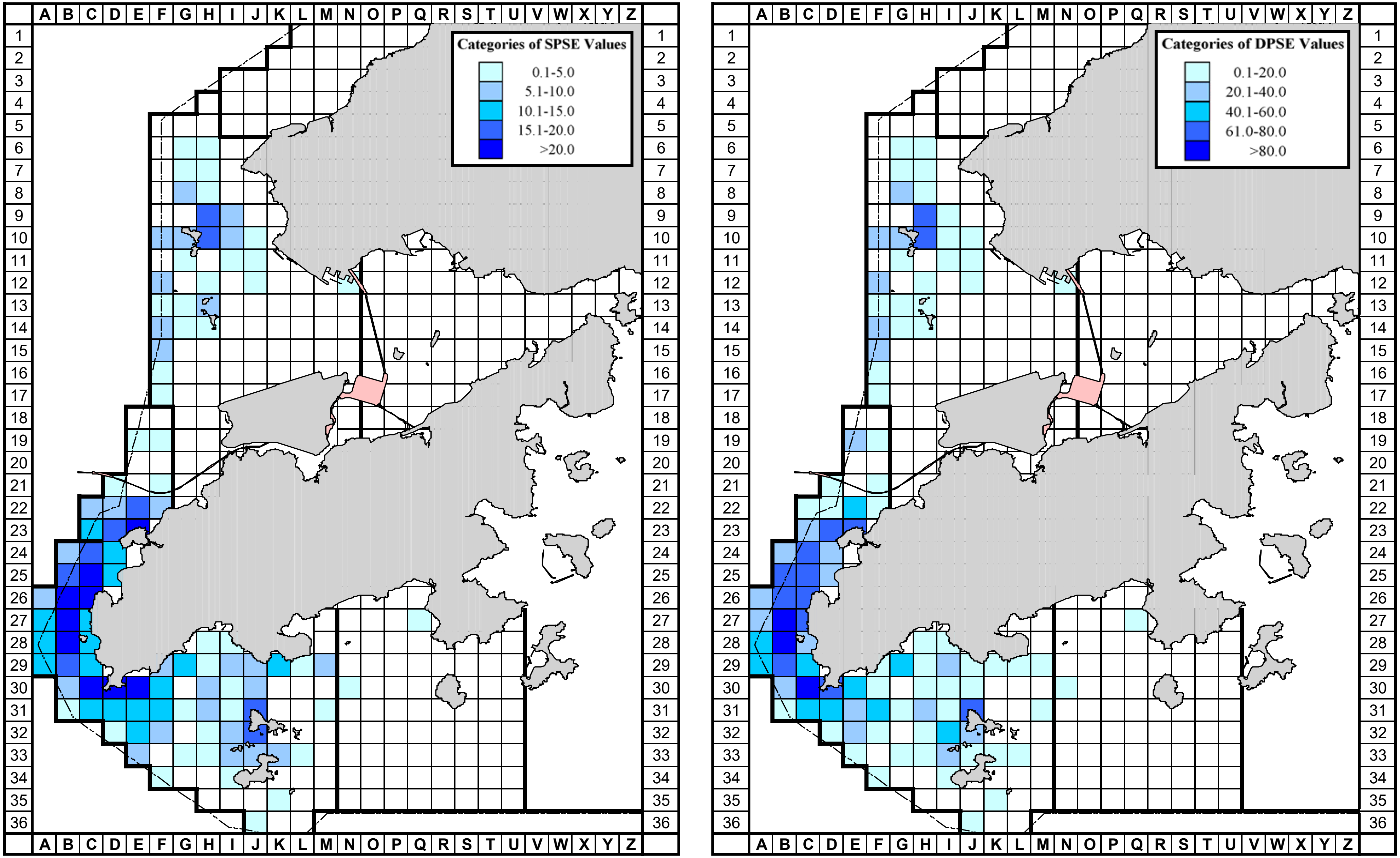


Figure 11. (left) Sighting density of Chinese white dolphins with corrected survey effort per km^2 in waters around Lantau Island (number within grids represent "SPSE" = no. of on-effort dolphin sightings per 100 units of survey effort) (using data from January - December 2016)

(right) Density of Chinese white dolphins with corrected survey effort per km^2 in waters around Lantau Island (number within grids represent "DPSE" = no. of dolphins per 100 units of survey effort) (using data from January - December 2016)

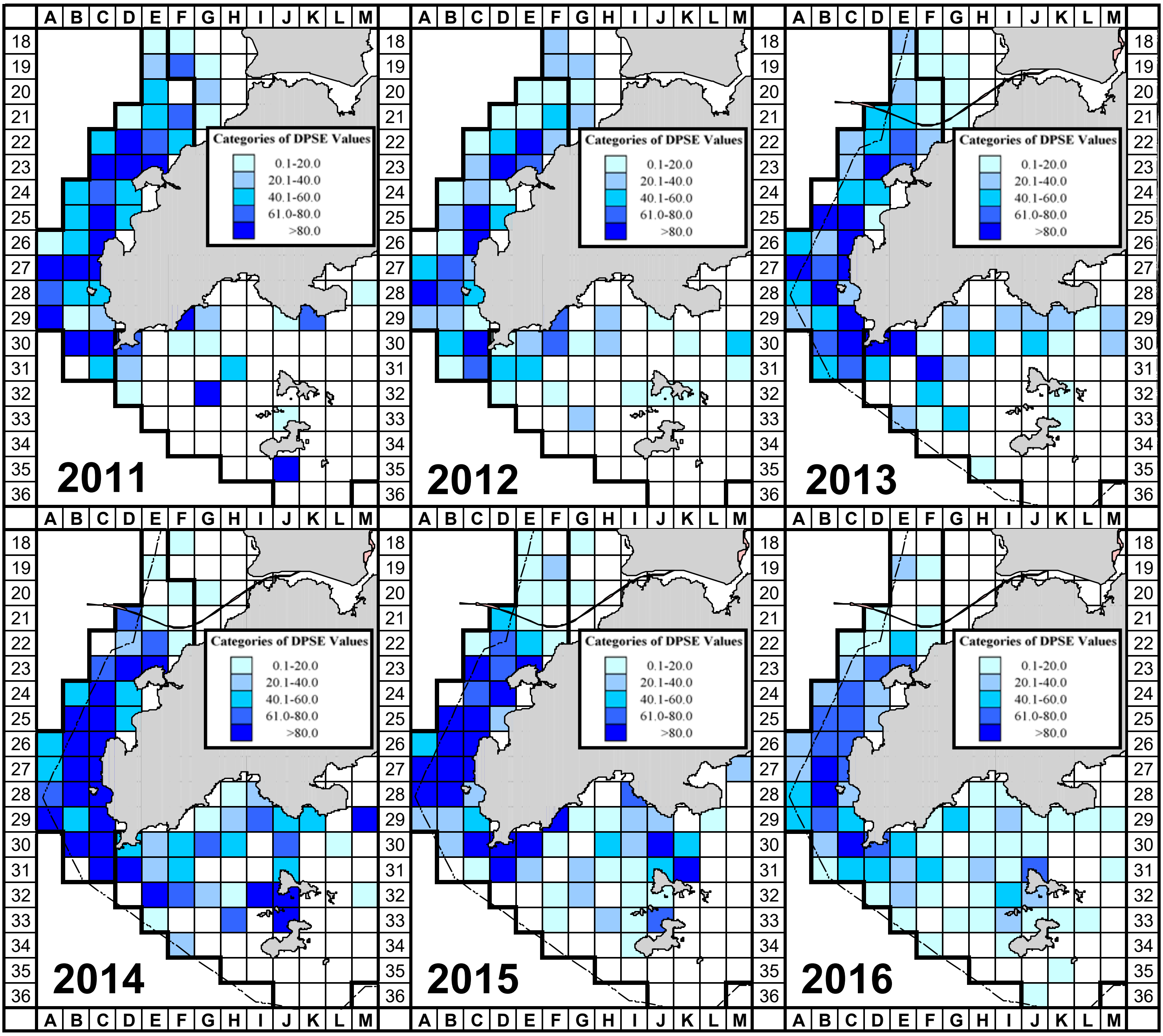


Figure 12. Comparison of Chinese white dolphin densities with corrected survey effort per km^2 in West Lantau Waters in 2011-16 (number within grids represent "DPSE" = no. of dolphins per 100 units of survey effort)

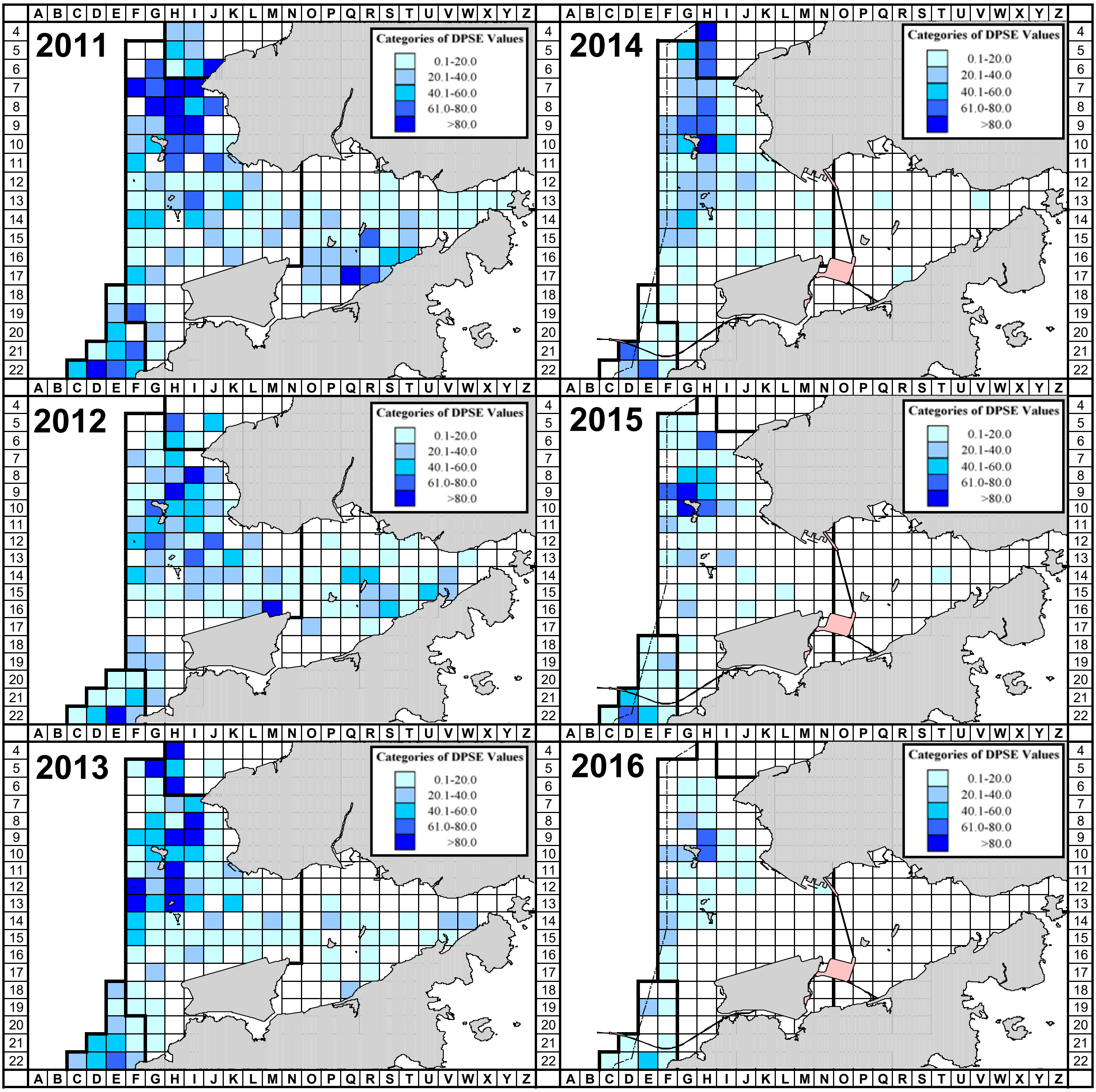


Figure 13. Comparison of dolphin densities with corrected survey effort per km^2 in North Lantau waters in 2011-16 (number within grids represent "DPSE" = no. of dolphins per 100 units of survey effort)

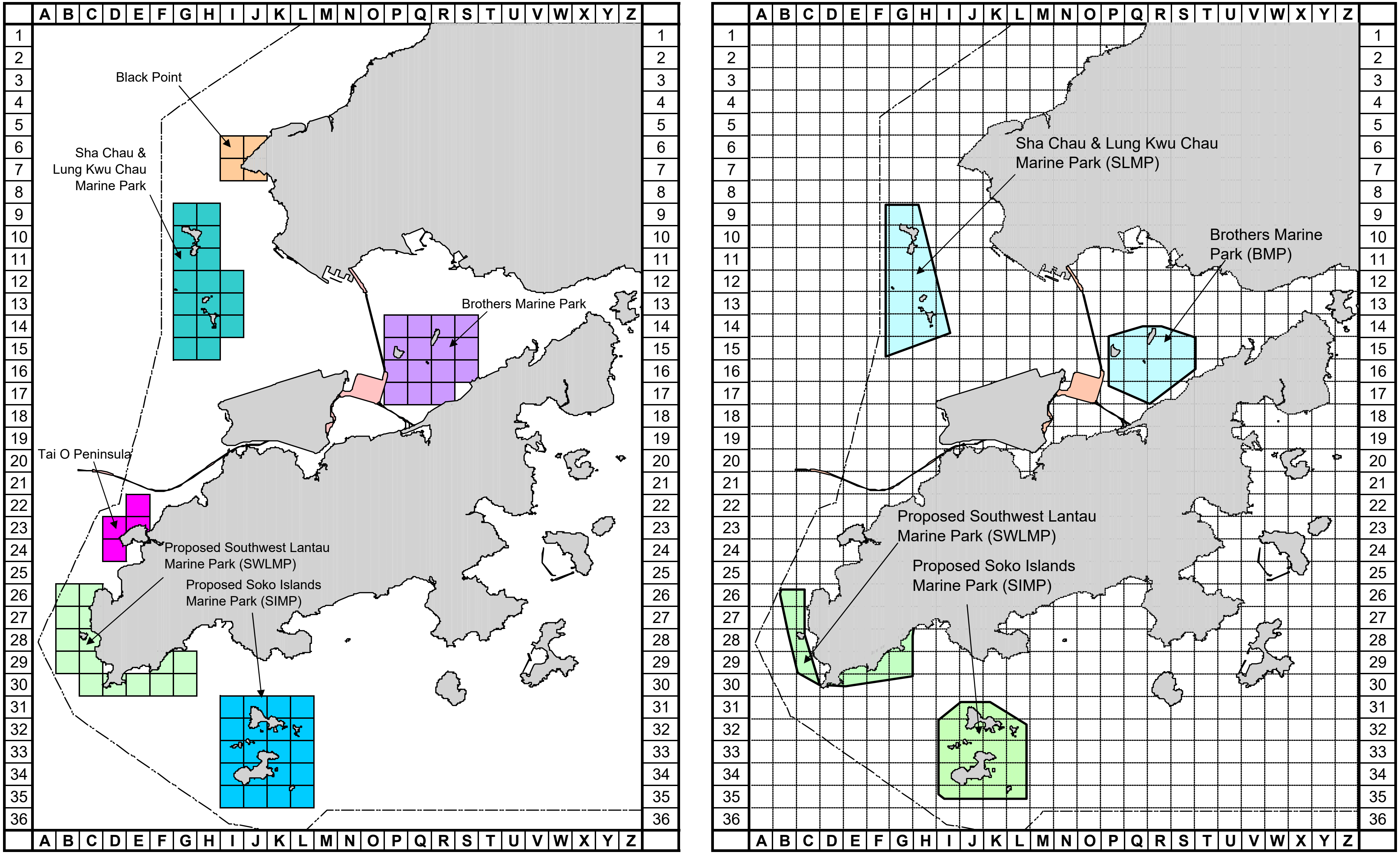


Figure 14. Grids of six key dolphin habitats that were examined for temporal trend in dolphin densities

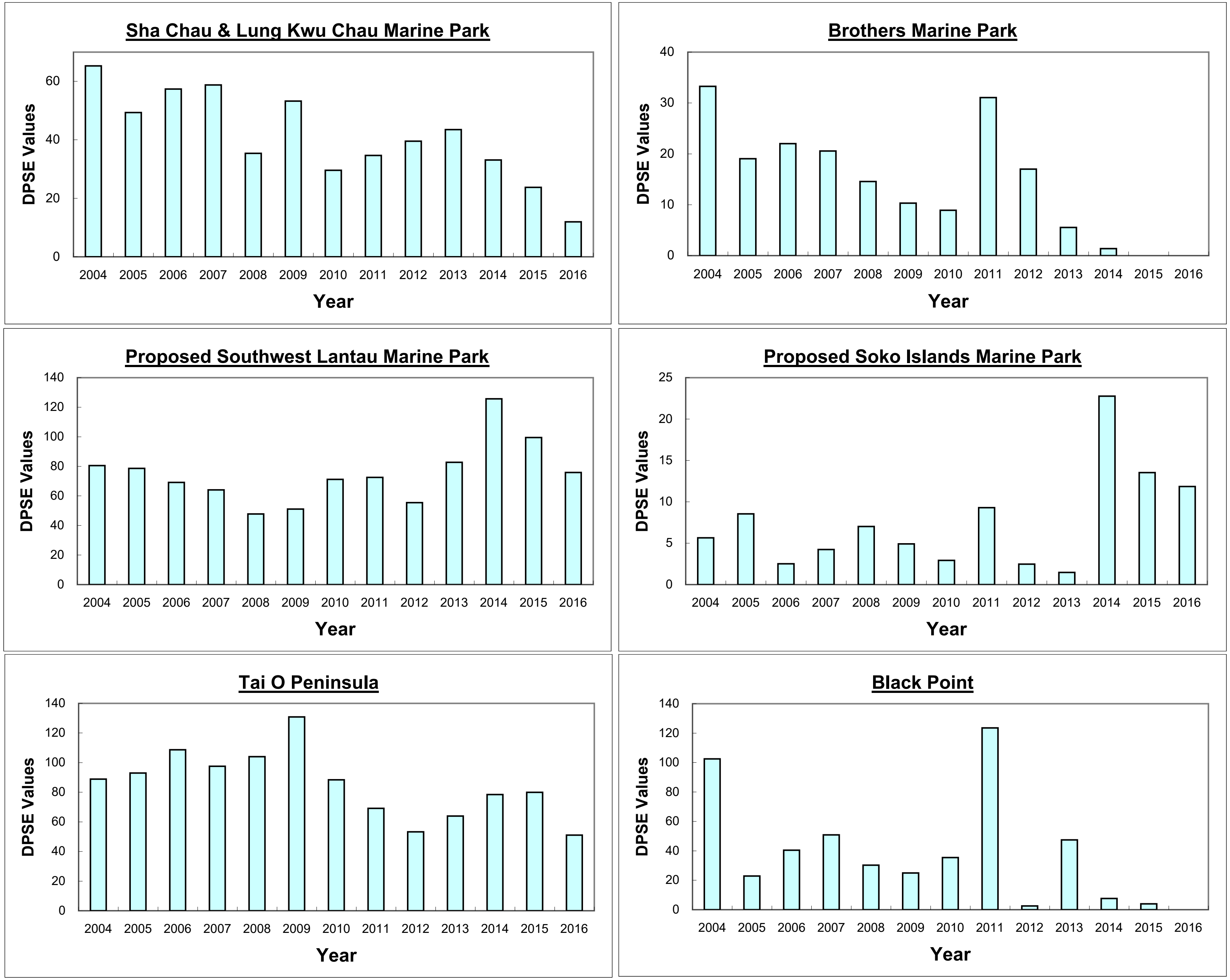


Figure 15. Temporal trend of dolphin densities (DPSE Values) at six key dolphin habitats in Lantau waters

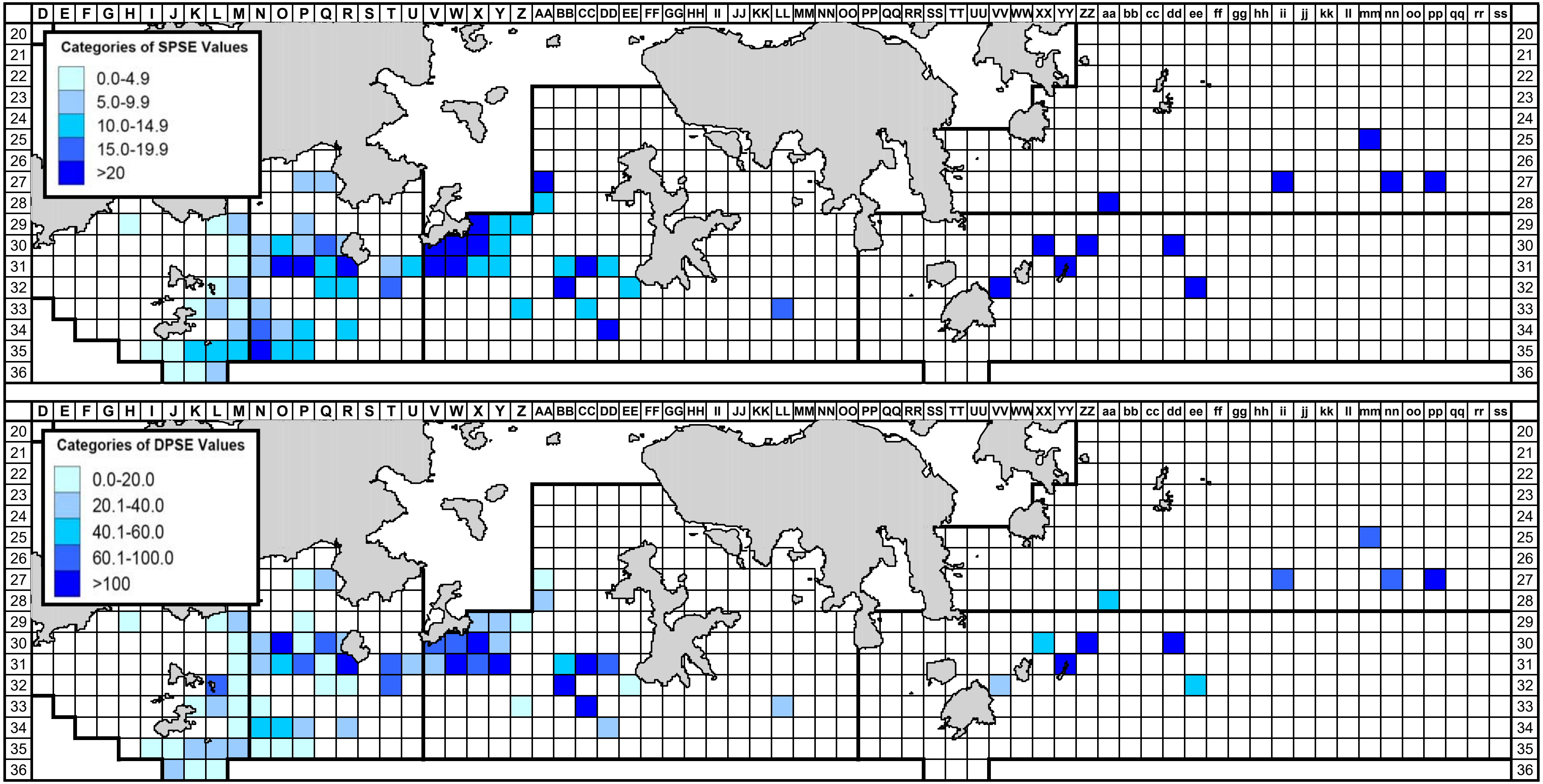


Figure 16. (top) Sighting density of finless porpoises with corrected survey effort per km^2 in southern waters of Hong Kong (number within grids represent "SPSE" = no. of on-effort porpoise sightings per 100 units of survey effort) (using data from January - December 2016)

(bottom) Density of finless porpoises with corrected survey effort per km^2 in southern waters of Hong Kong (number within grids represents "DPSE" = no. of porpoises per 100 units of survey effort) (using data from January - December 2016)

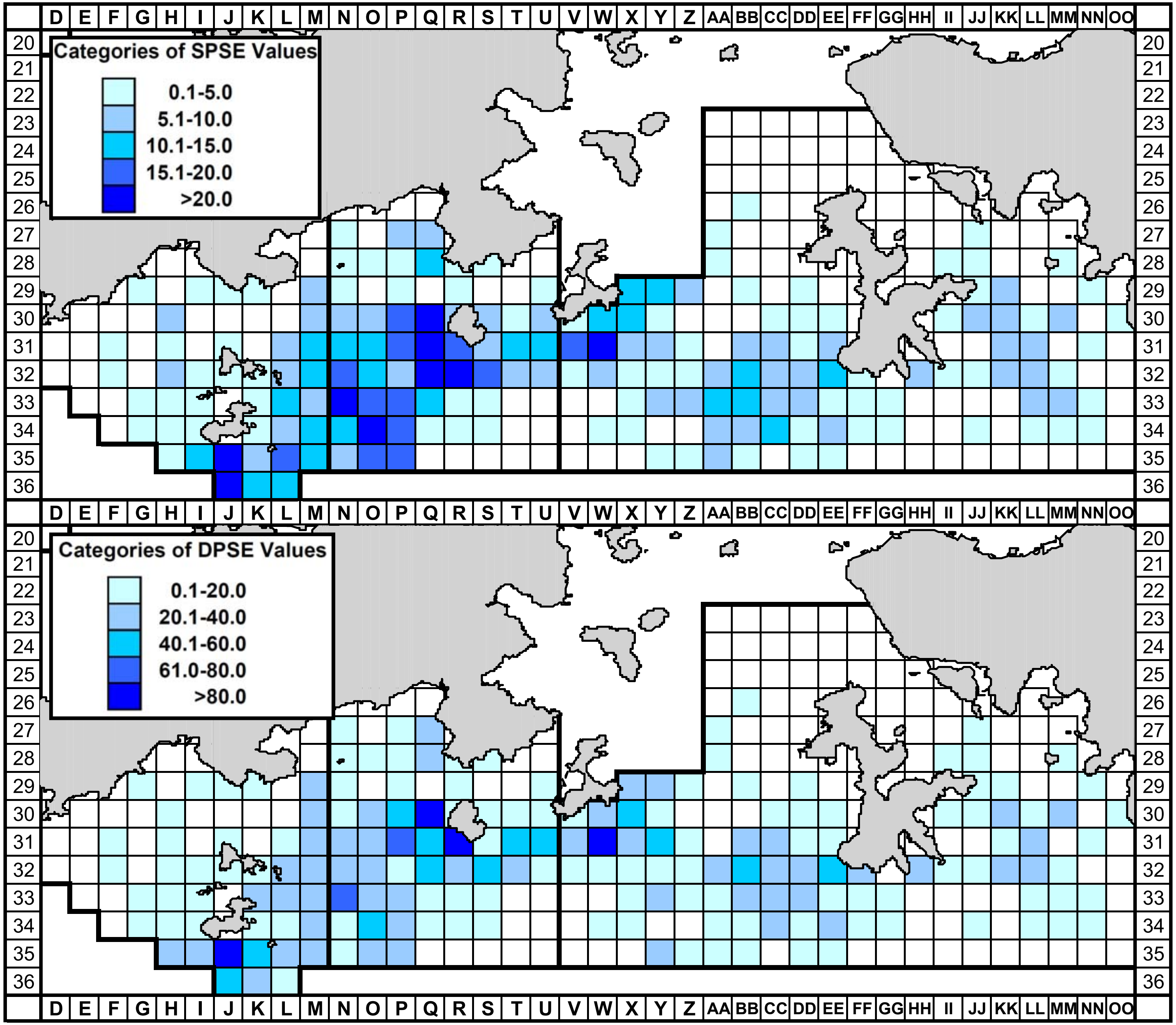


Figure 17. Density of finless porpoises with corrected survey effort per km^2 in southern waters of Hong Kong during dry season (December to May), using data collected during 2007-16 (SPSE = no. of on-effort porpoise sightings per 100 units of survey effort; DPSE = no. of porpoises per 100 units of survey effor

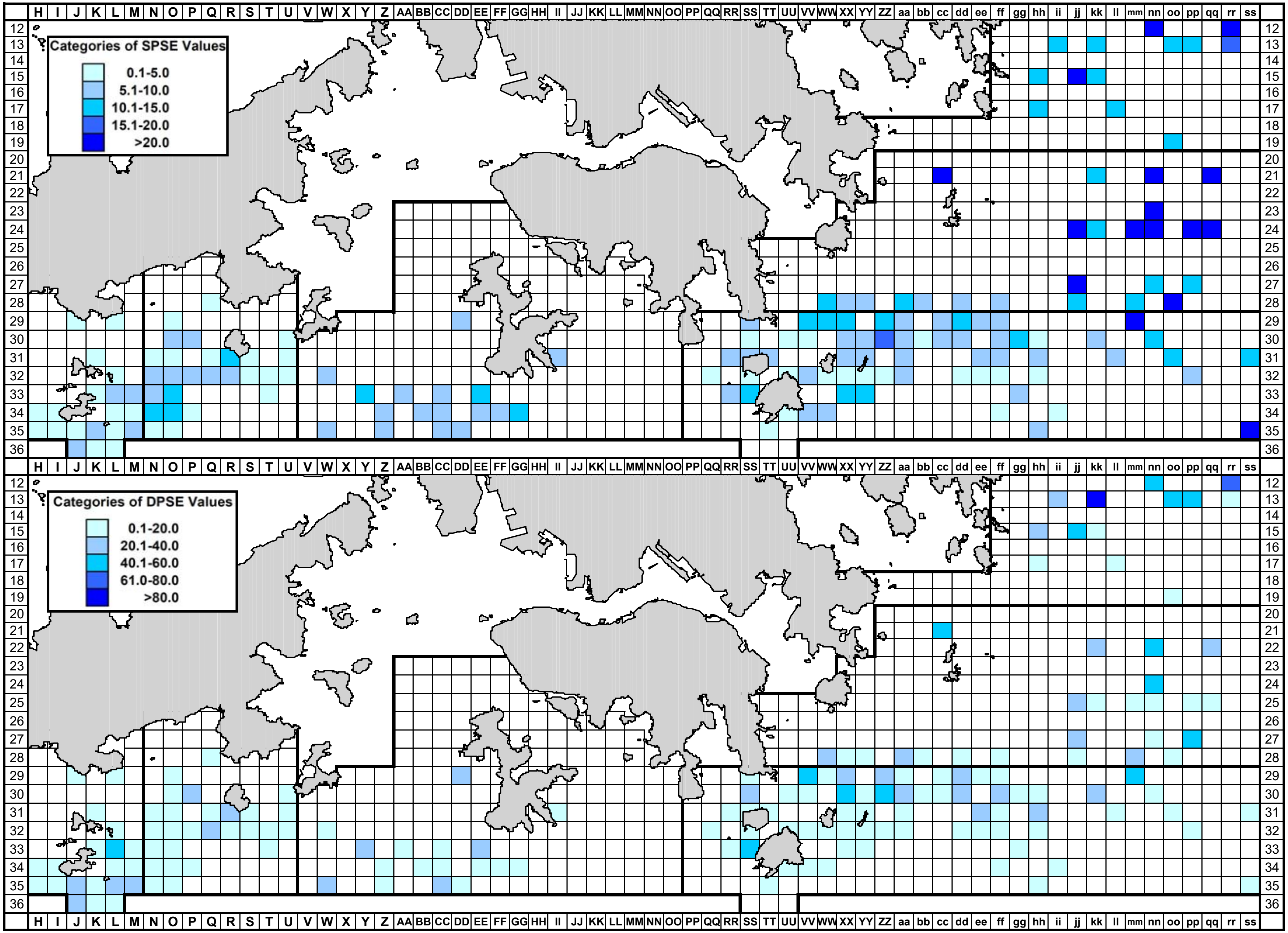


Figure 18. Density of finless porpoises with corrected survey effort per km^2 in southern and eastern waters of Hong Kong during wet season (June to November), using data collected during 2007-16 (SPSE = no. of on-effort porpoise sightings per 100 units of survey effort; DPSE = no. of porpoises per 100 units of survey effort

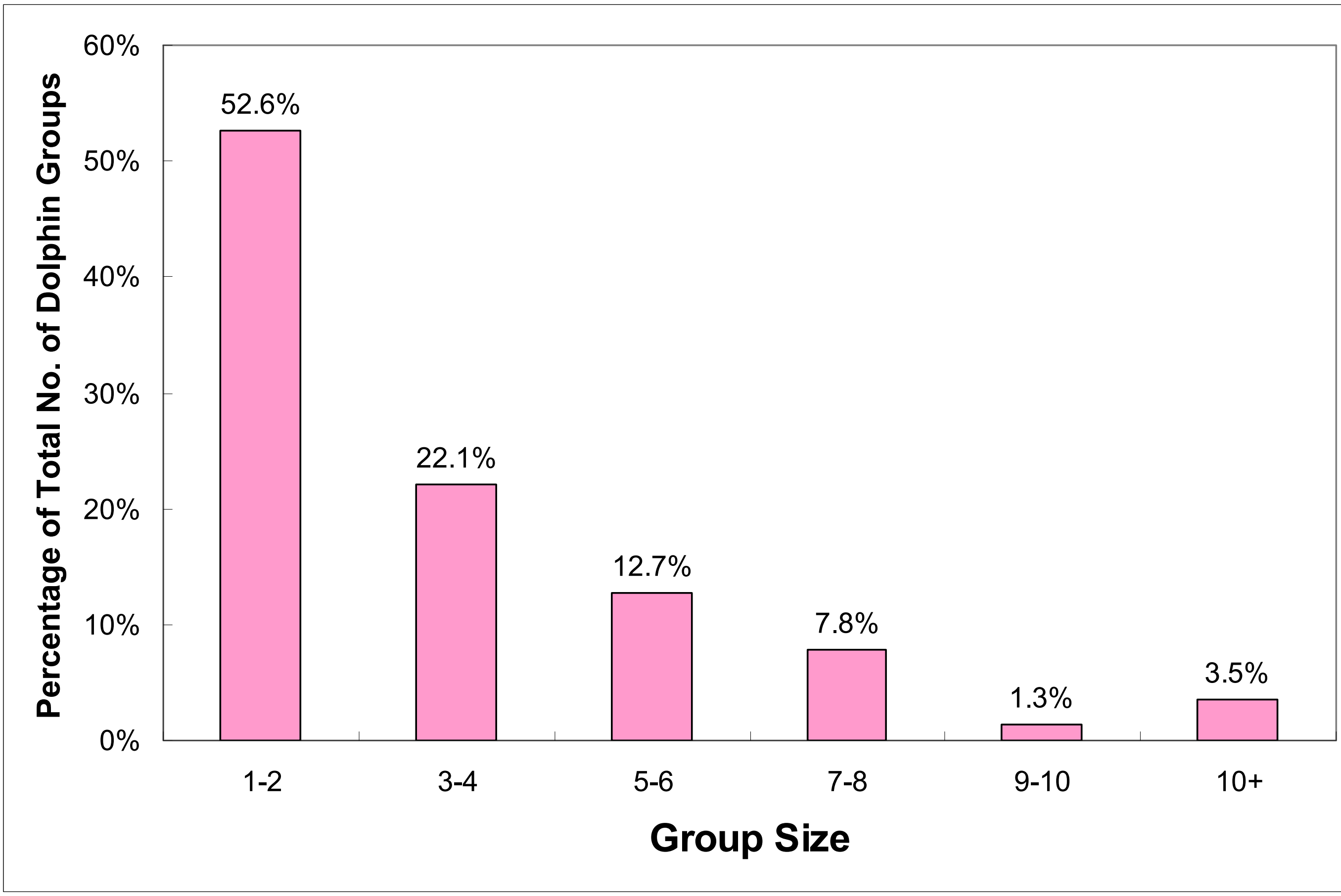


Figure 19. Percentages of different group sizes of Chinese white dolphins in Hong Kong during April 2016 to March 2017

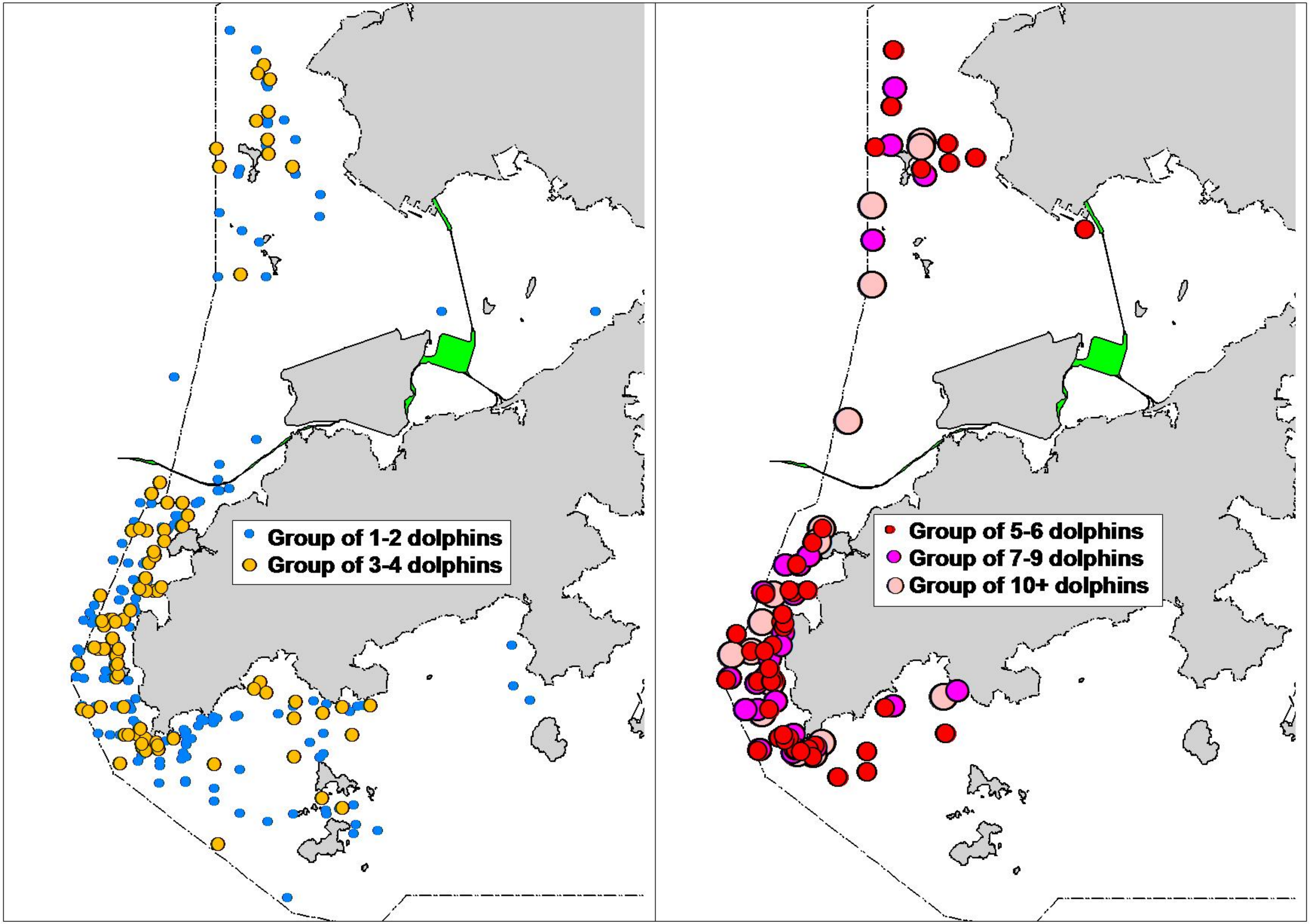


Figure 20. Distribution of Chinese white dolphins with different group sizes in 2016

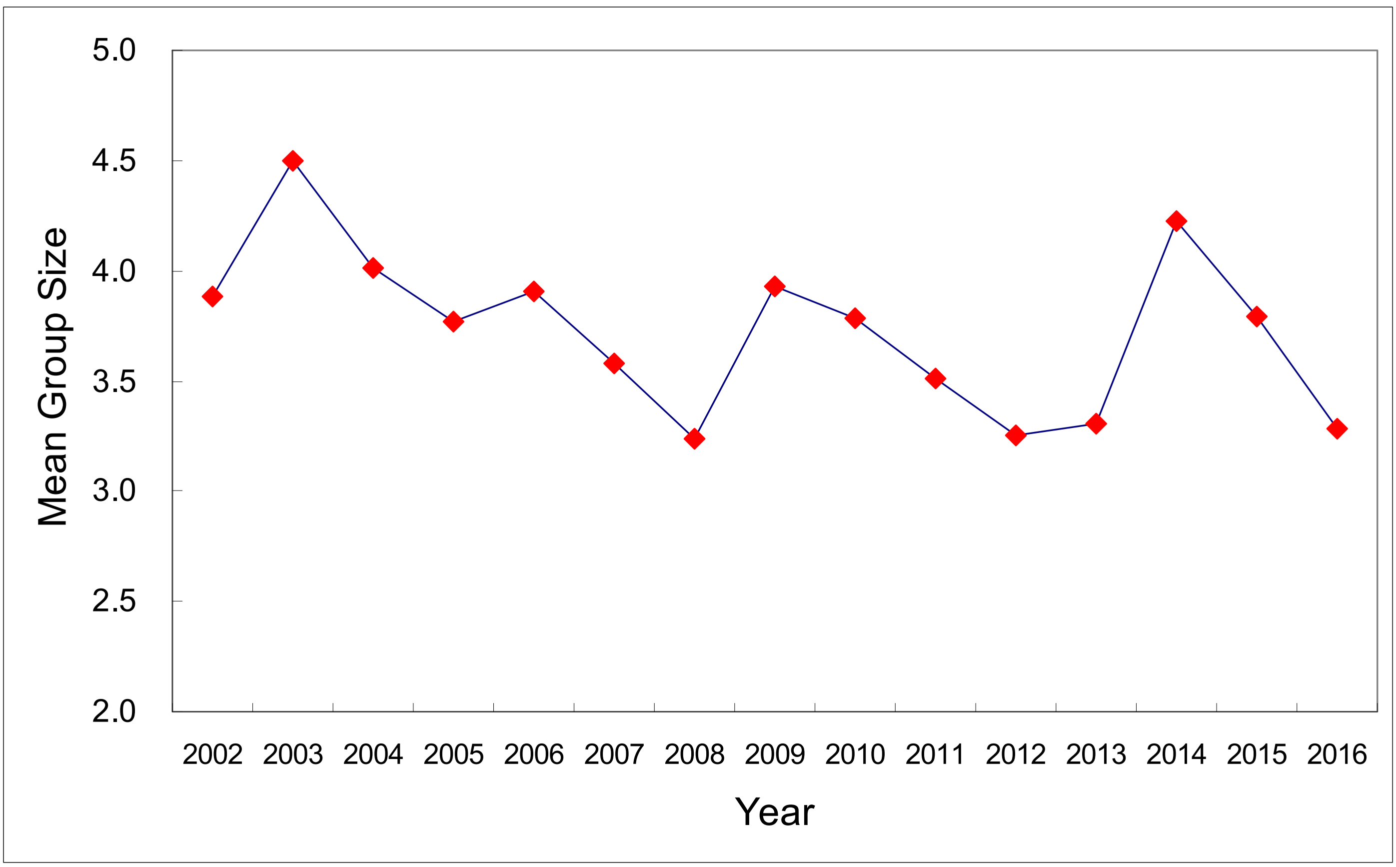


Figure 21. Temporal trend of mean dolphin group size in 2002-16

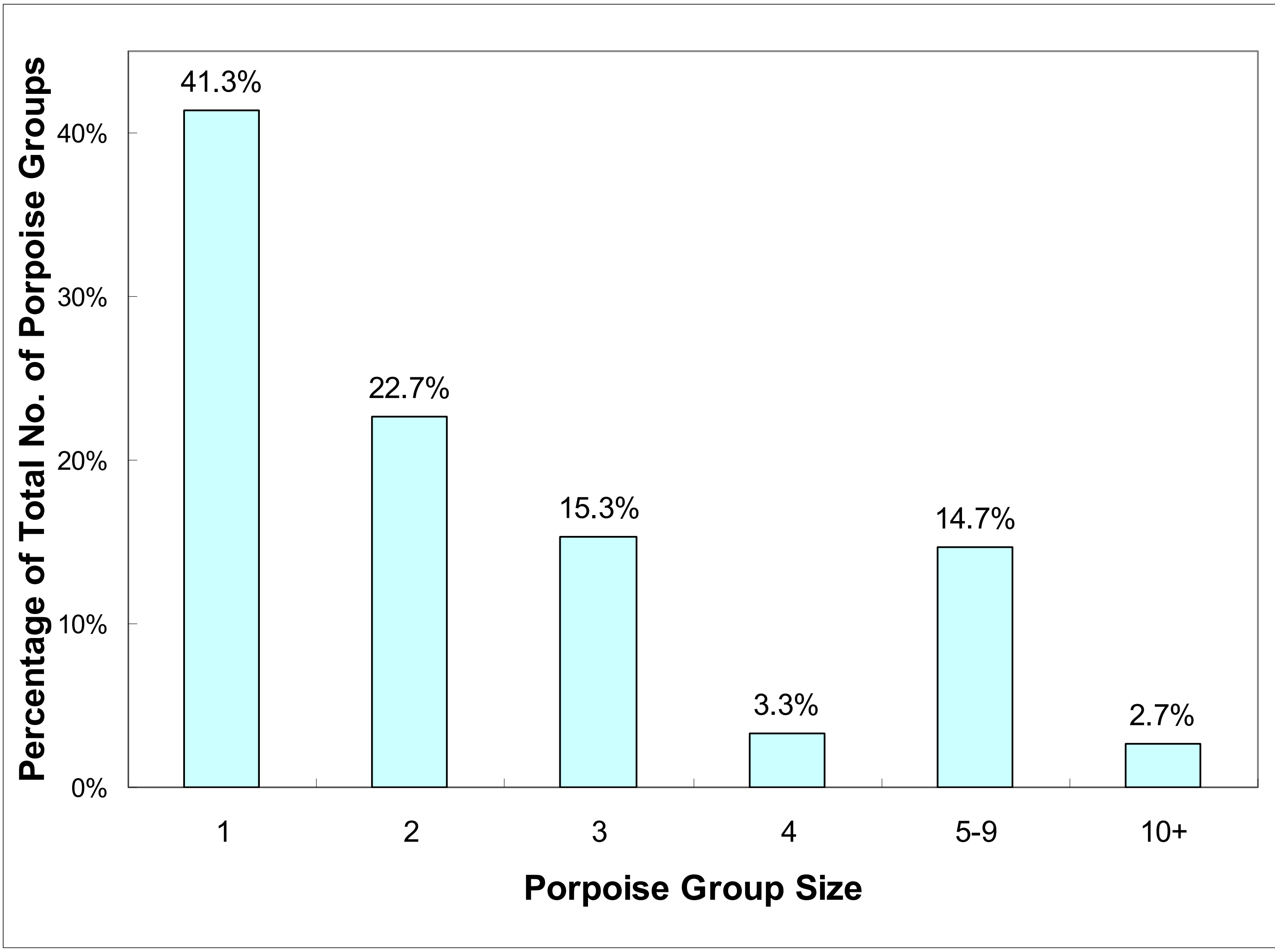


Figure 22. Percentages of different group sizes of finless porpoises in Hong Kong during April 2016 to March 2017

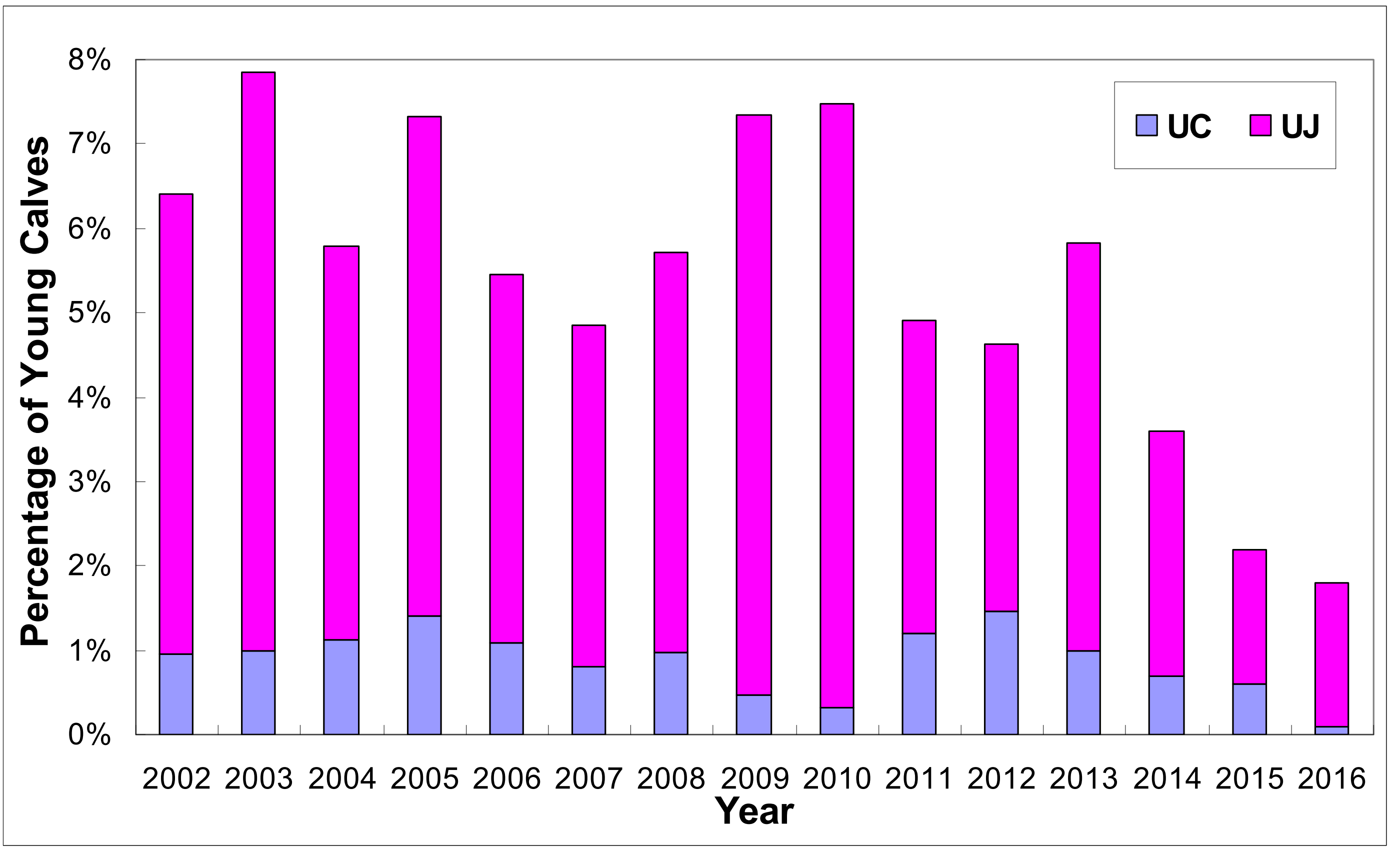


Figure 23. Percentages of young calves (i.e. Unspotted Calves (UC) and Unspotted Juveniles (UJ)) among all dolphin groups during 2002-16

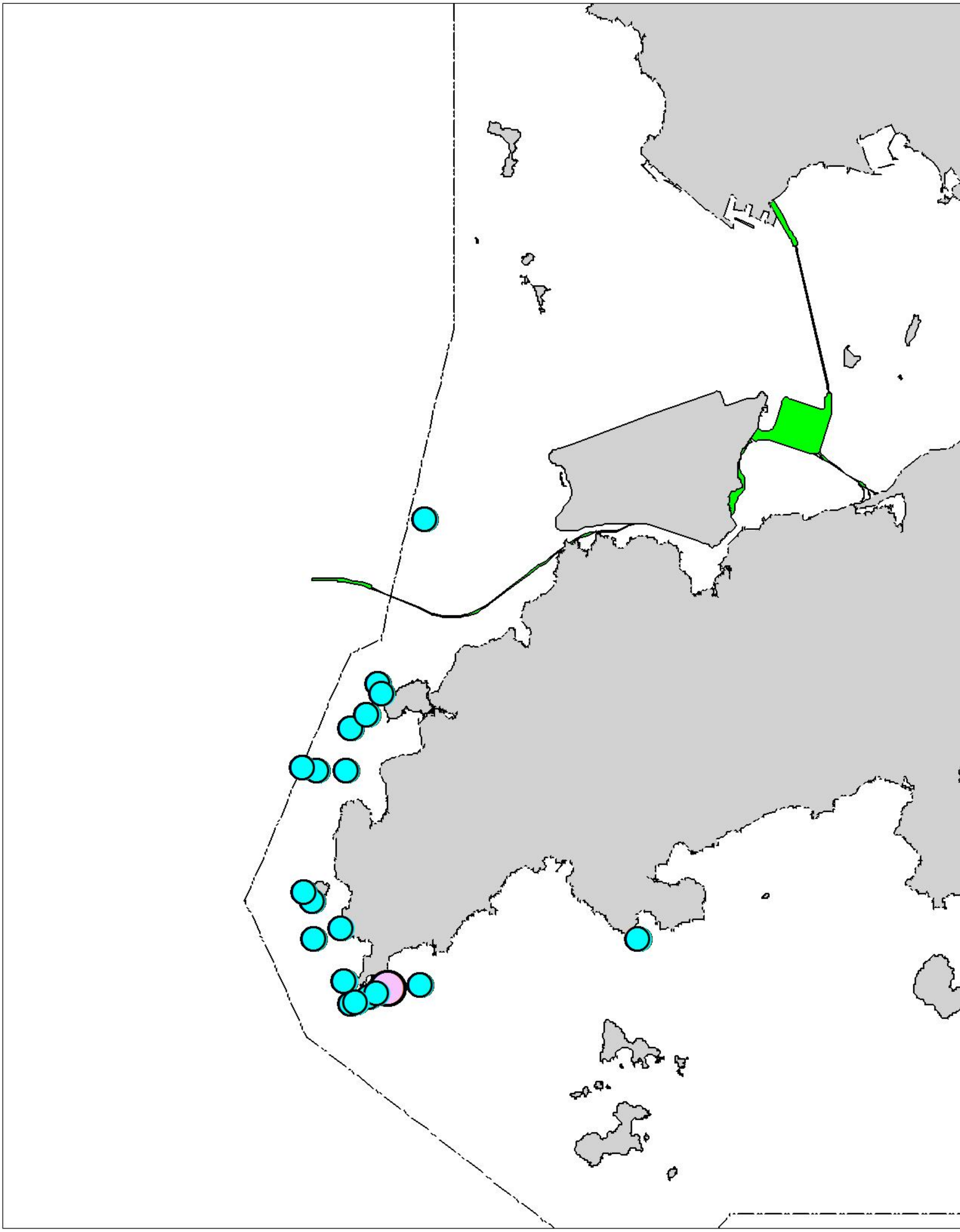


Figure 24. Distribution of Unspotted Calves (purple dots) & Unspotted Juveniles (blue dots) in 2016

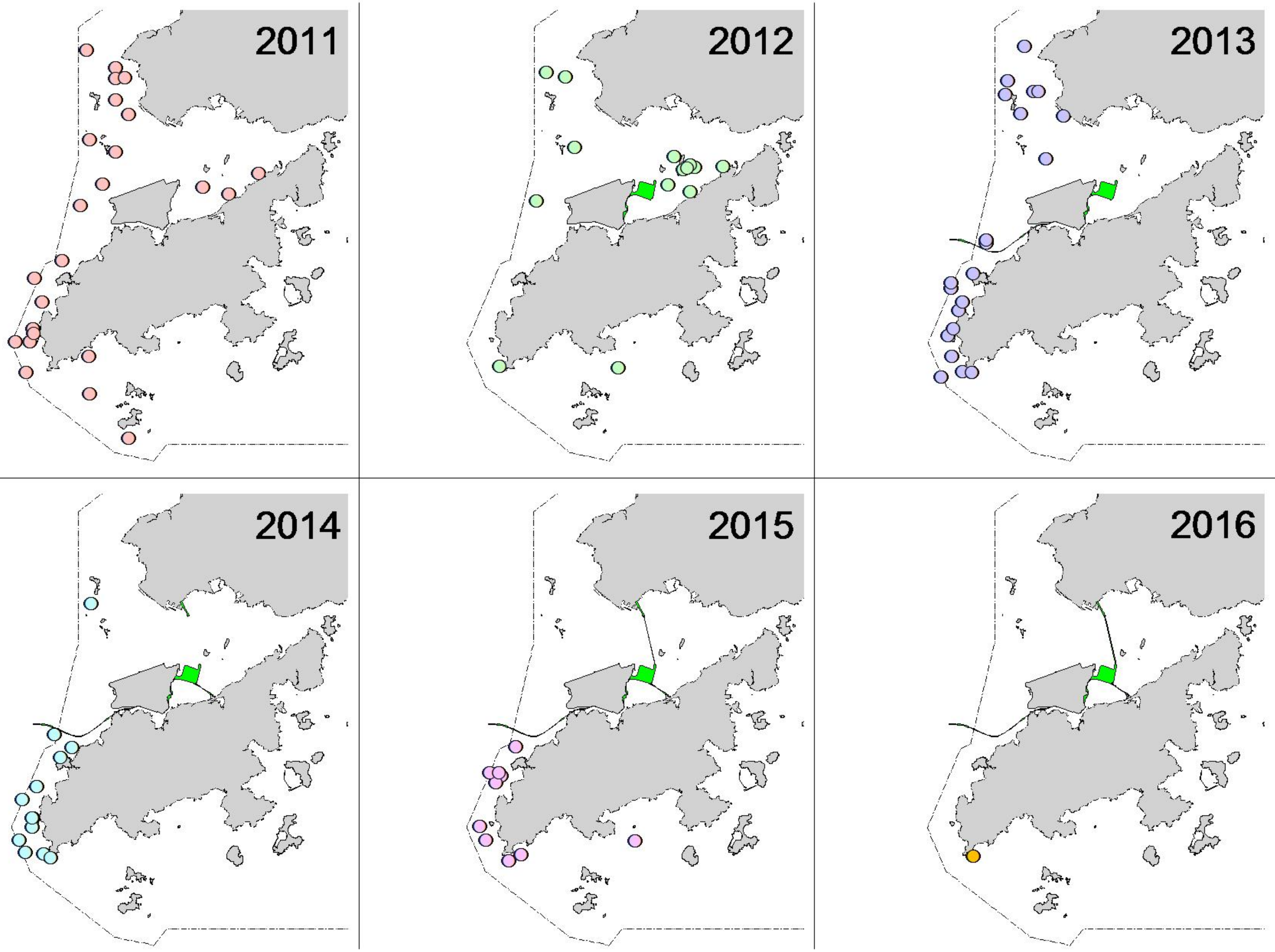


Figure 25. Temporal changes in distribution of unspotted calves (UCs) in 2011-16

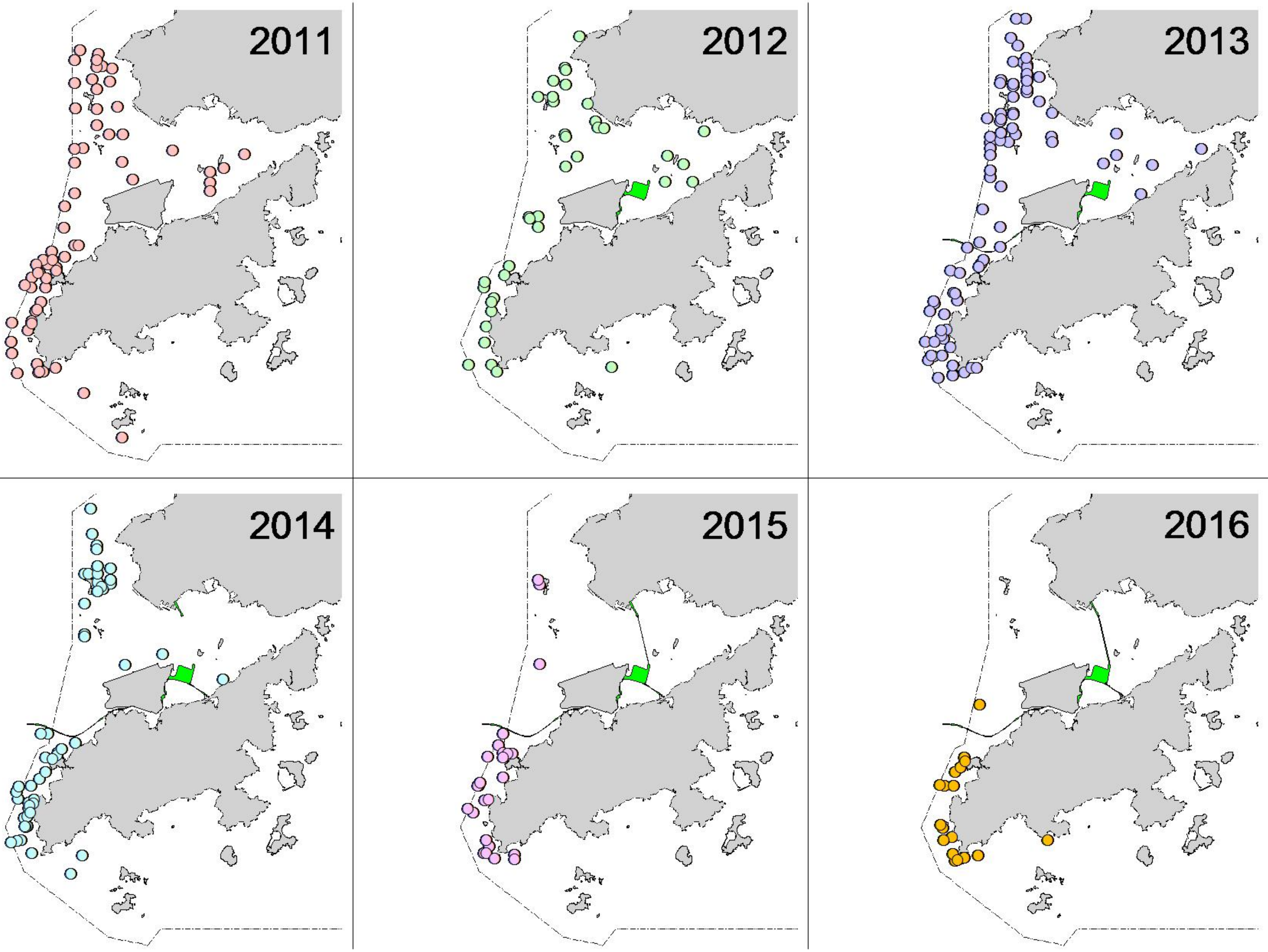


Figure 26. Temporal changes in distribution of unspotted juveniles (UJs) in 2011-16

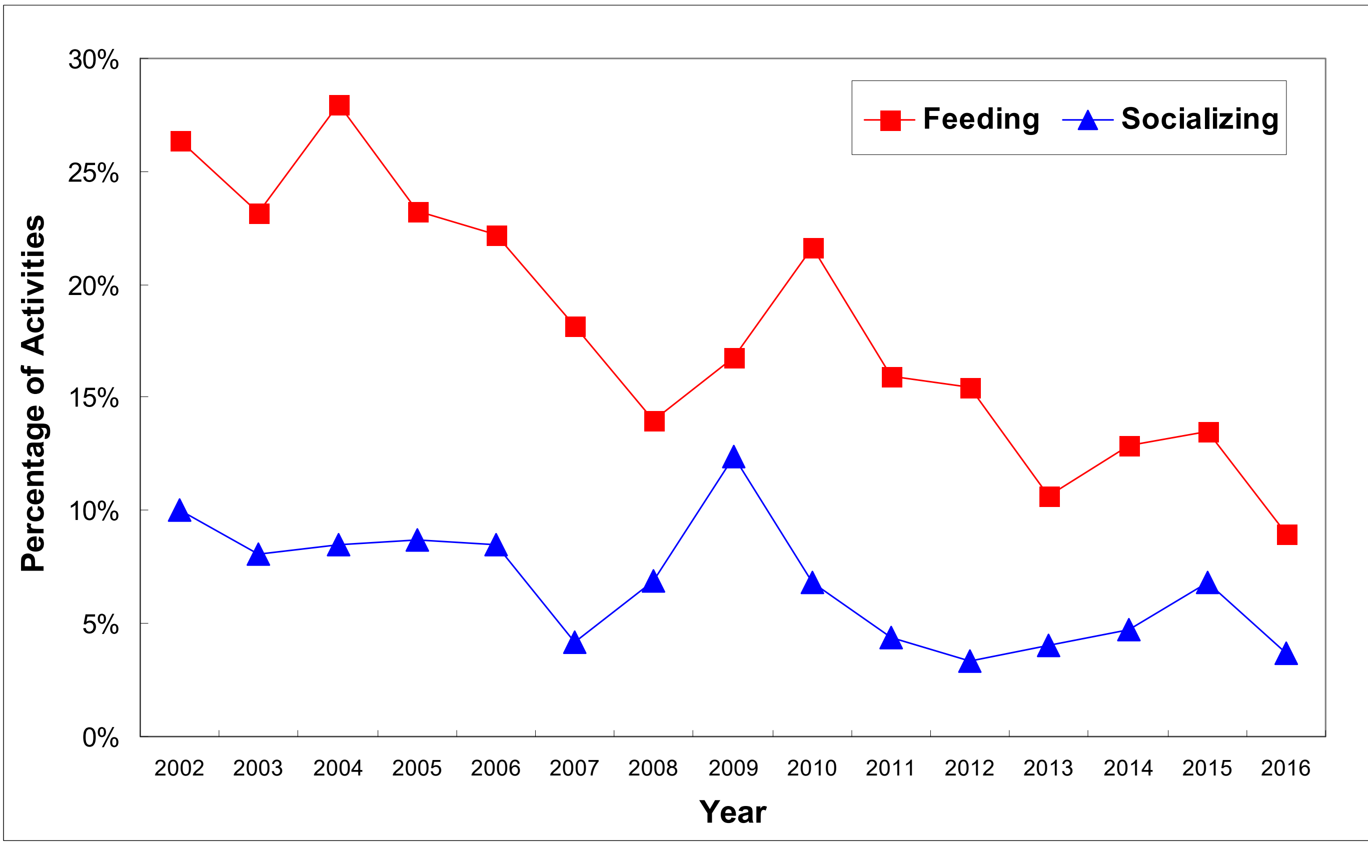


Figure 27. Percentages of feeding and socializing activities among all dolphin groups sighted in Hong Kong during 2002-16

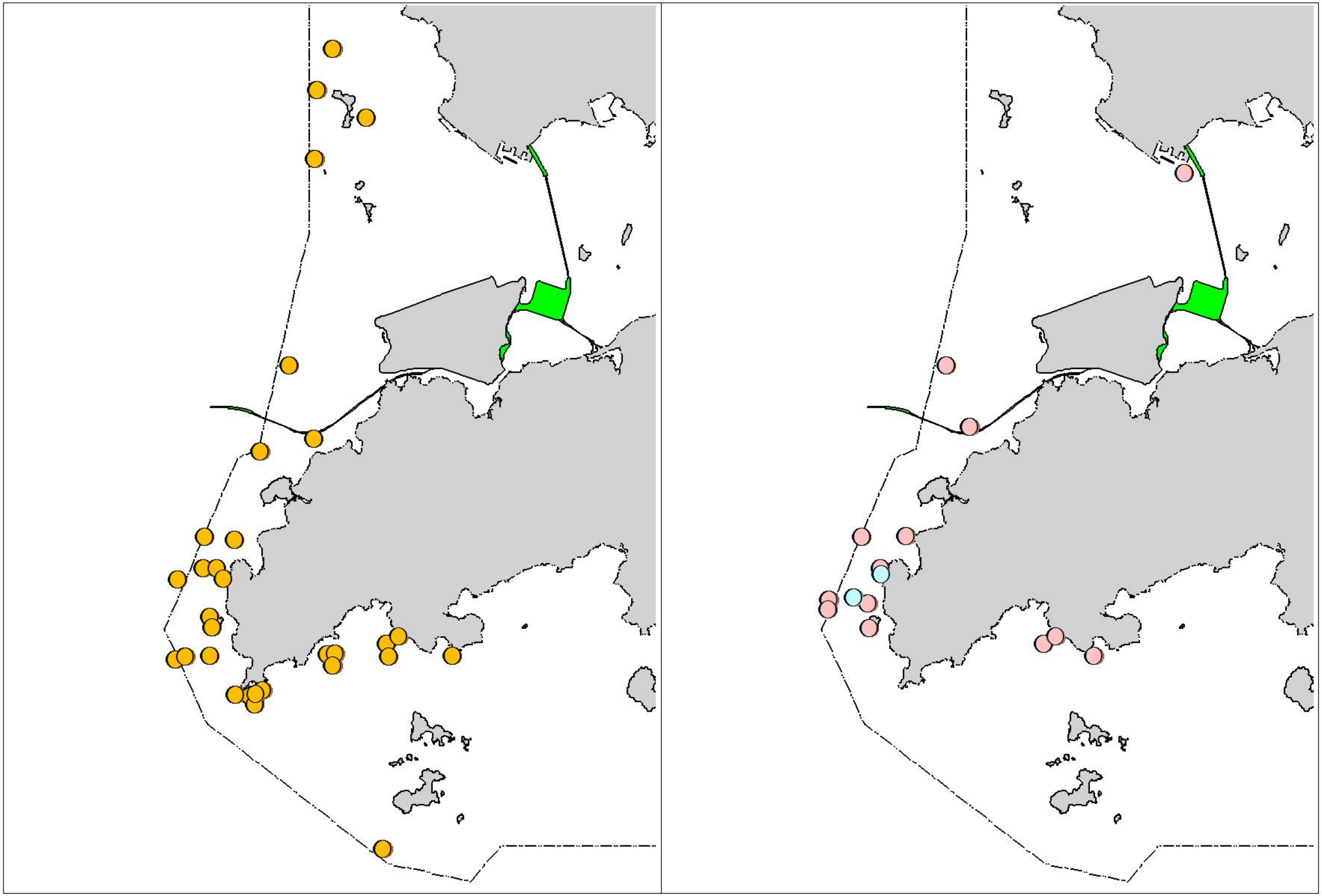


Figure 28. Distribution of Chinese white dolphins engaged in feeding (orange dots), socializing (pink dots) and traveling (blue dots) activities in 2016

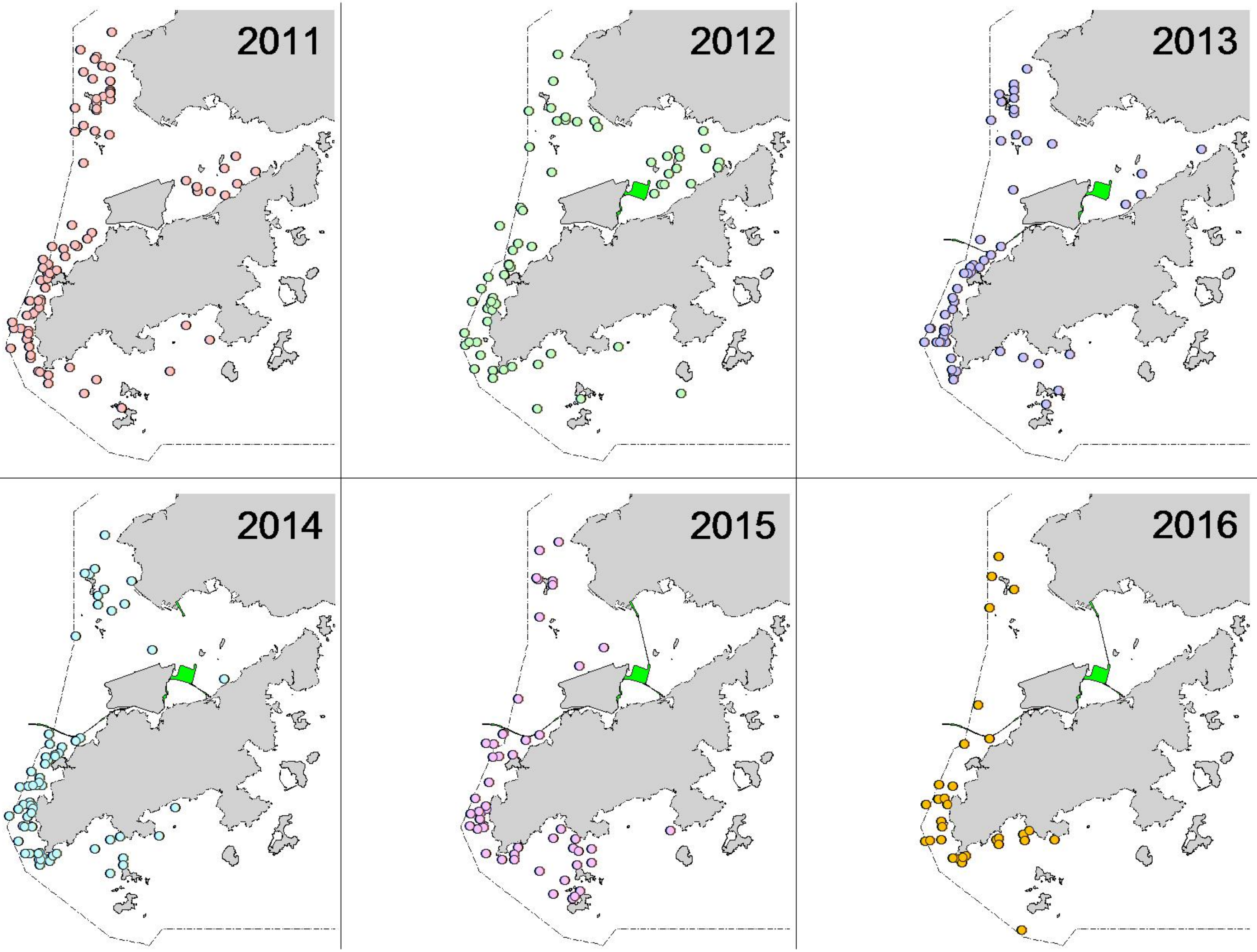


Figure 29. Temporal changes in distribution of dolphin groups engaged in feeding activities in 2011-16

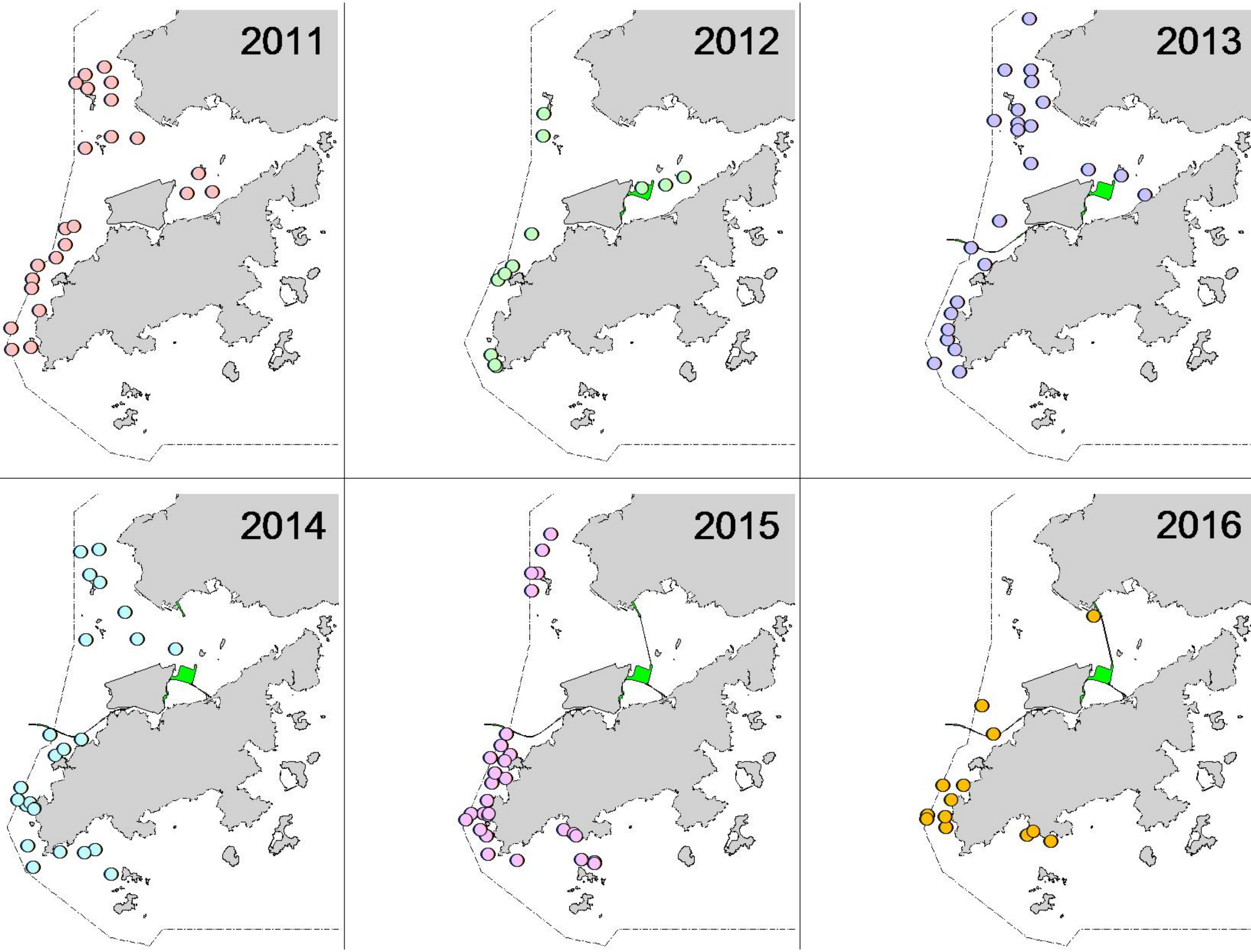


Figure 30. Temporal changes in distribution of dolphin groups engaged in socializing activities in 2011-16

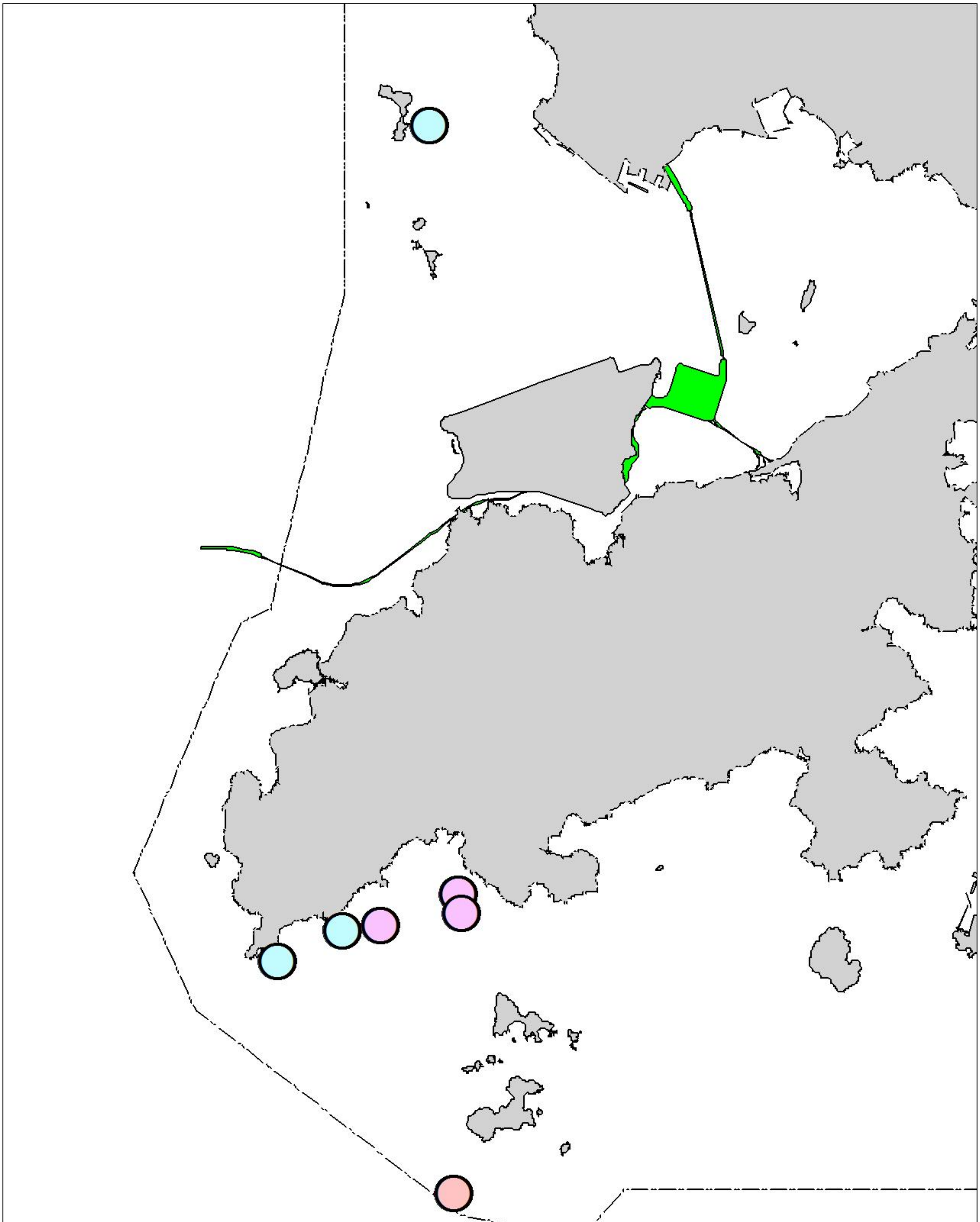


Figure 31. Distribution of dolphin sightings associated with fishing boats in 2016
(purple dots: with purse-seiners, blue dot: with gill-netter; pink dot: pair trawler)

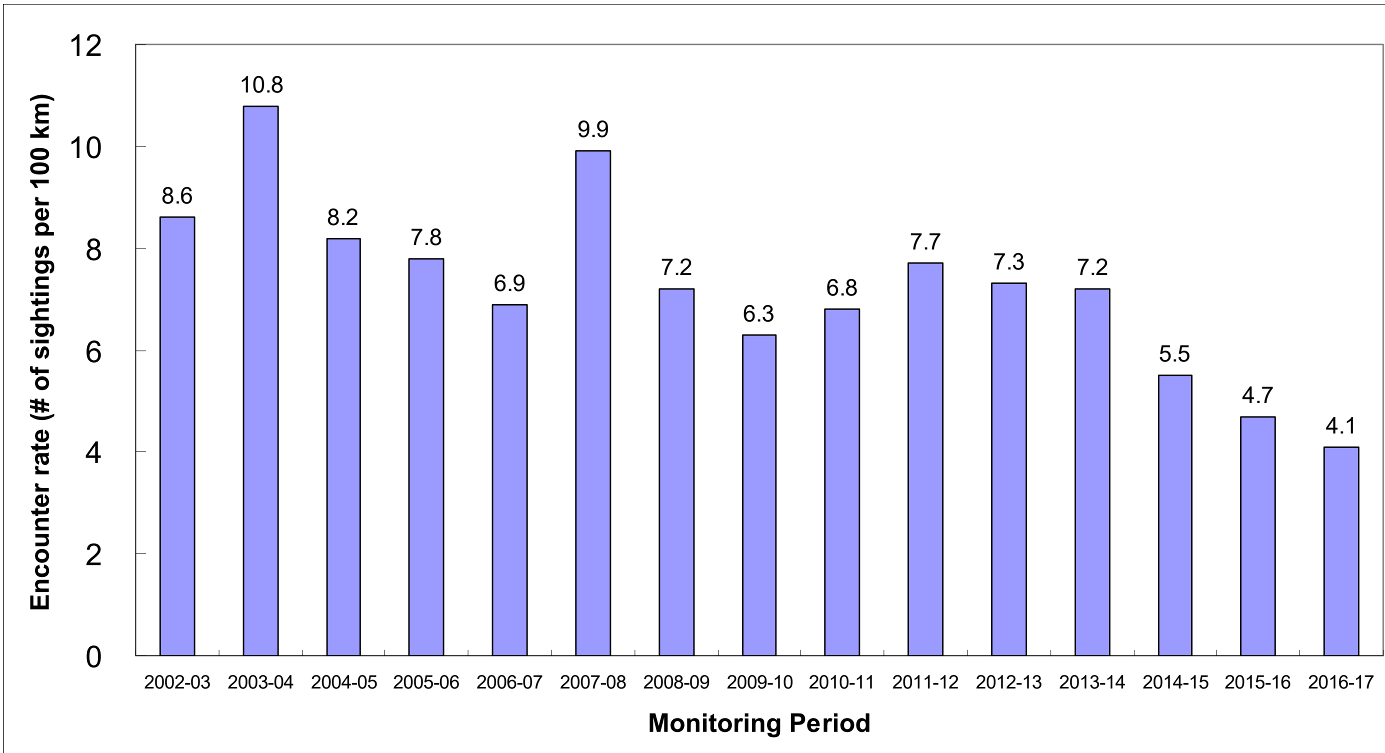


Figure 32. Temporal trend in encounter rates of Chinese white dolphins (combined from WL, NWL, NEL and SWL survey areas) in the past fifteen monitoring periods from 2002-17

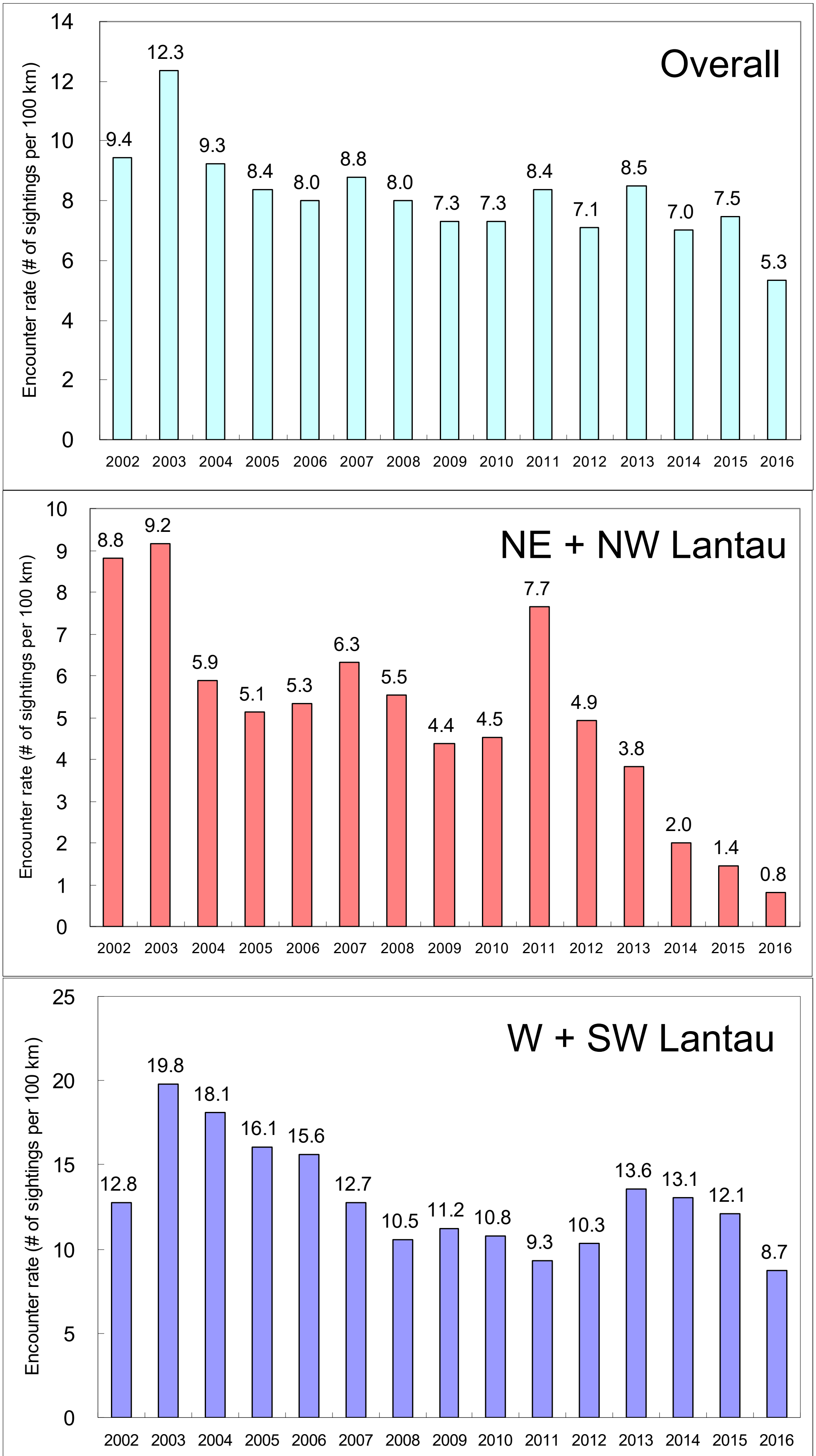


Figure 33. Long-term trends in annual dolphin encounter rates in different survey areas

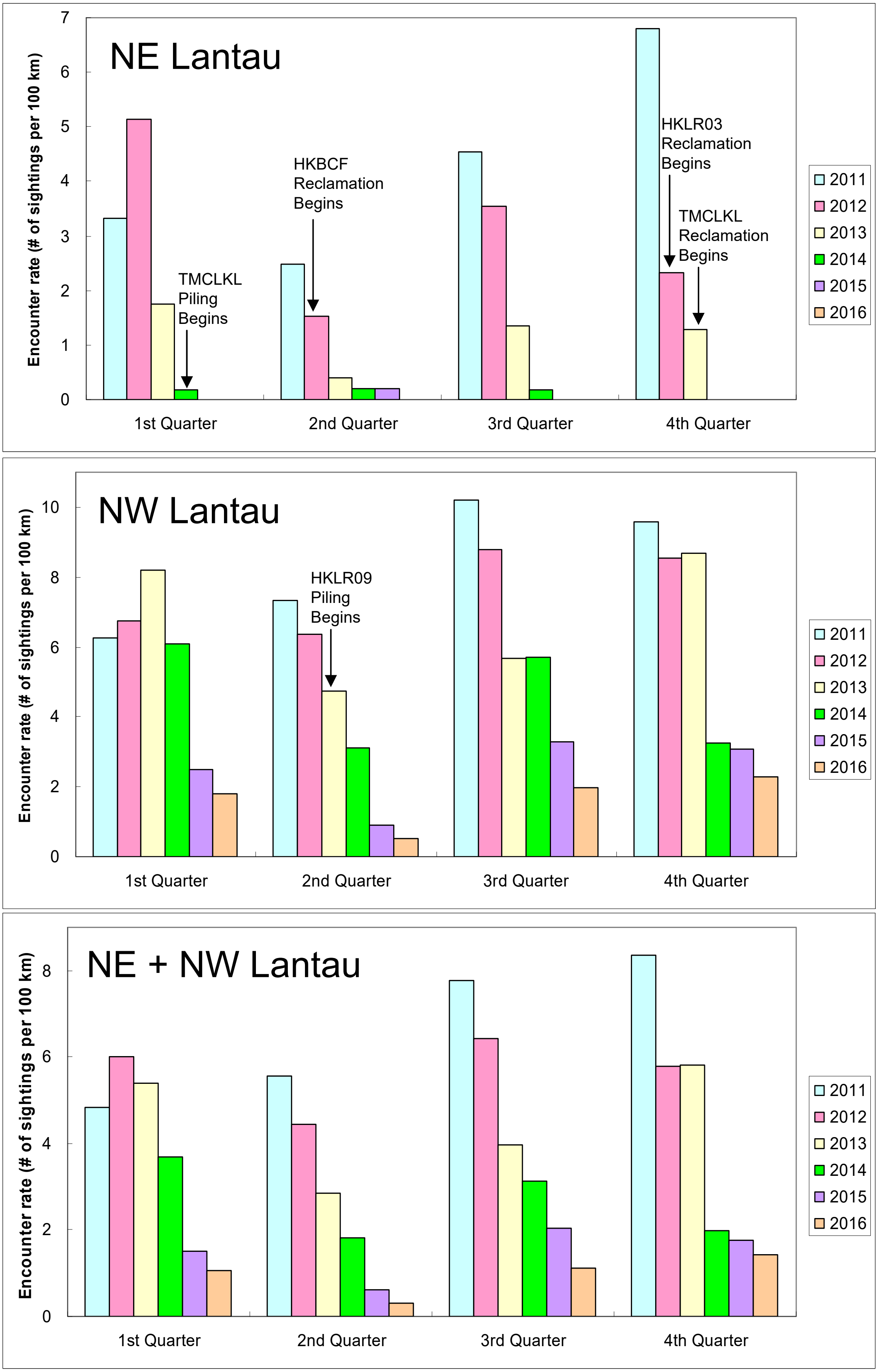


Figure 34. Temporal trends in quarterly dolphin encounter rates in North Lantau region from 2011-16 in association with schedules of HZMB works in NEL waters

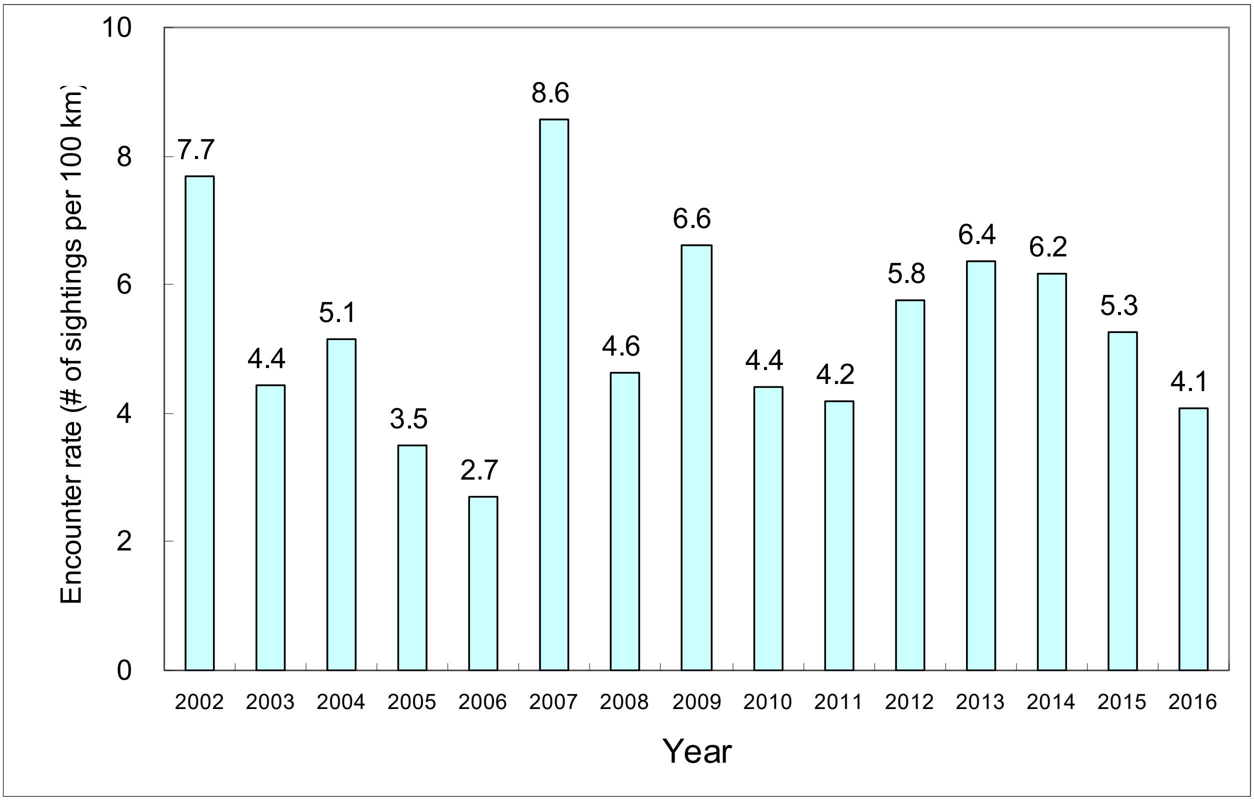


Figure 35a. Temporal trend of annual encounter rates of finless porpoises (combined from SWL, SEL, LM and PT survey areas) from 2002-16

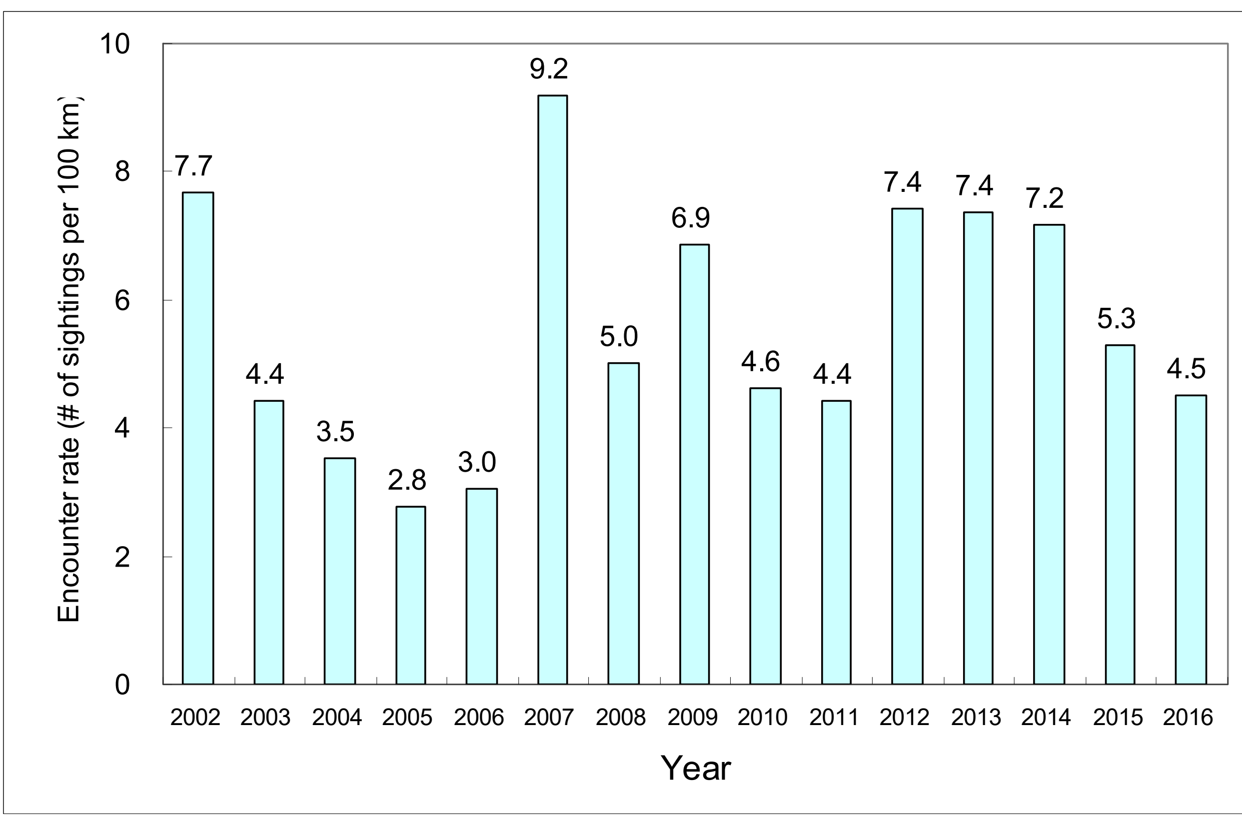


Figure 35b. Temporal trend of porpoise encounter rates in South Lantau and Lamma waters combined from winter/spring months of 2002-16

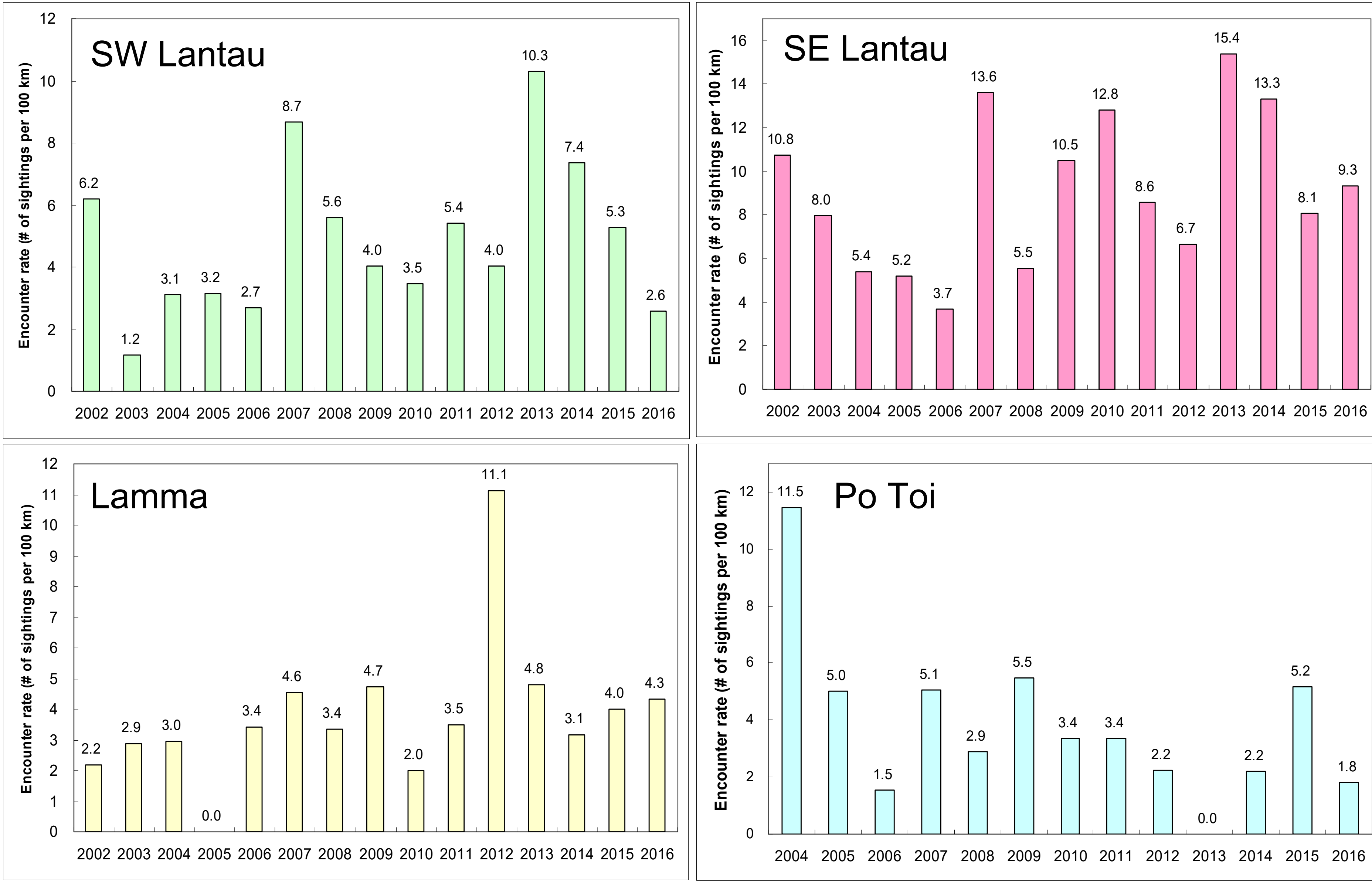


Figure 36. Temporal trends in annual encounter rates of finless porpoises among different survey areas

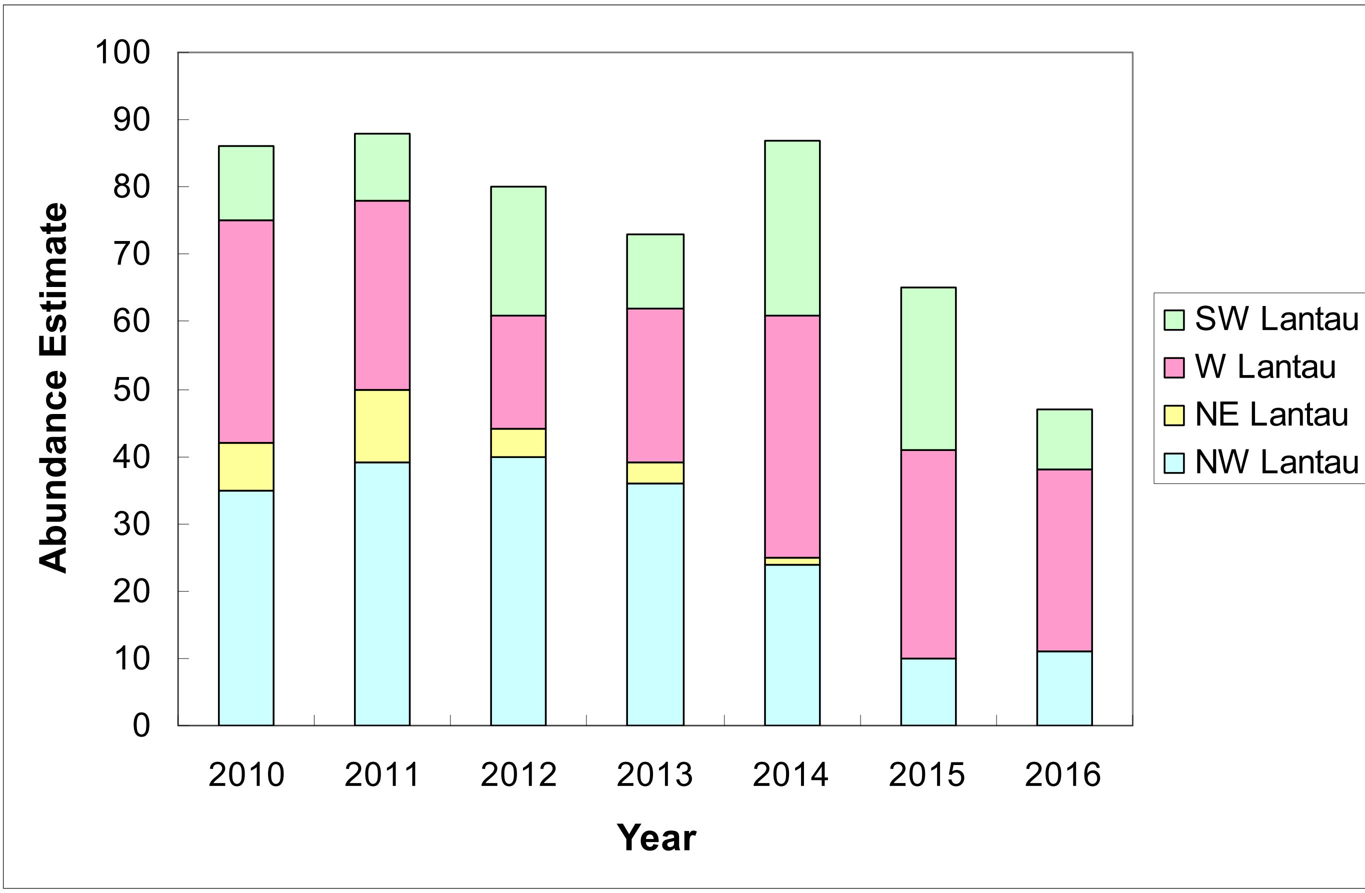


Figure 37. Temporal trends in combined abundance estimates of Chinese White Dolphins in Southwest, West, Northwest & Northeast Lantau from 2010-16

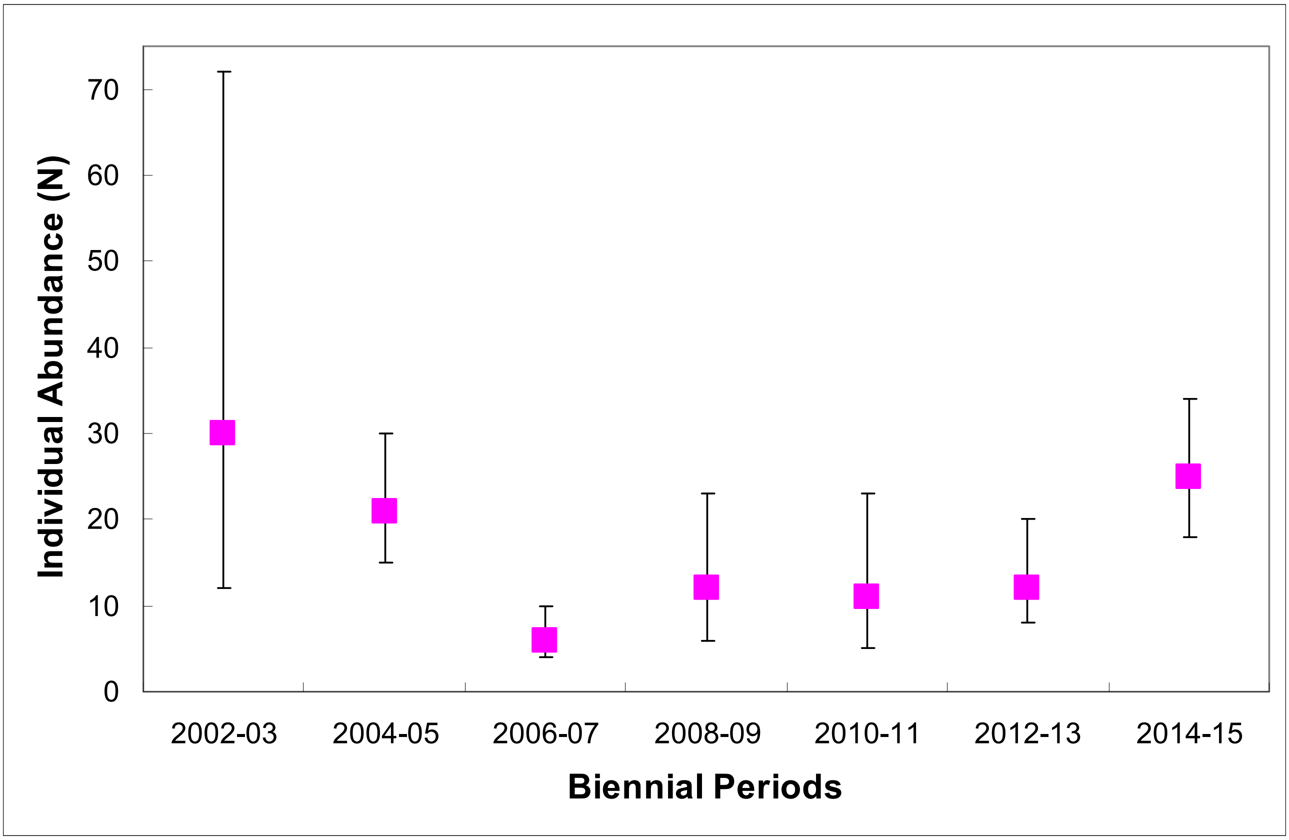


Figure 38a. Temporal trend in biennial abundance estimates of Chinese white dolphins in Southwest Lantau during 2002-15 (error bars: 95% confidence interval of abundance estimates)

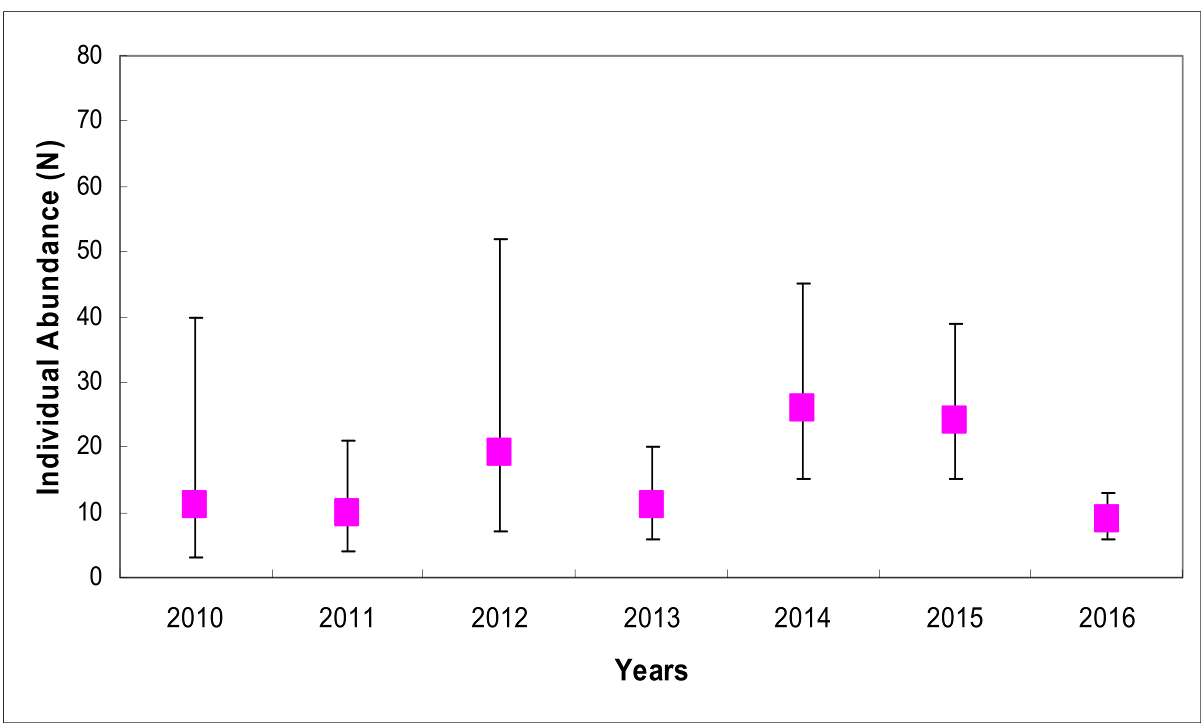


Figure 38b. Temporal trend in annual abundance estimates of Chinese white dolphins in Southwest Lantau from 2010-16 (error bars: 95% confidence interval of abundance estimates)

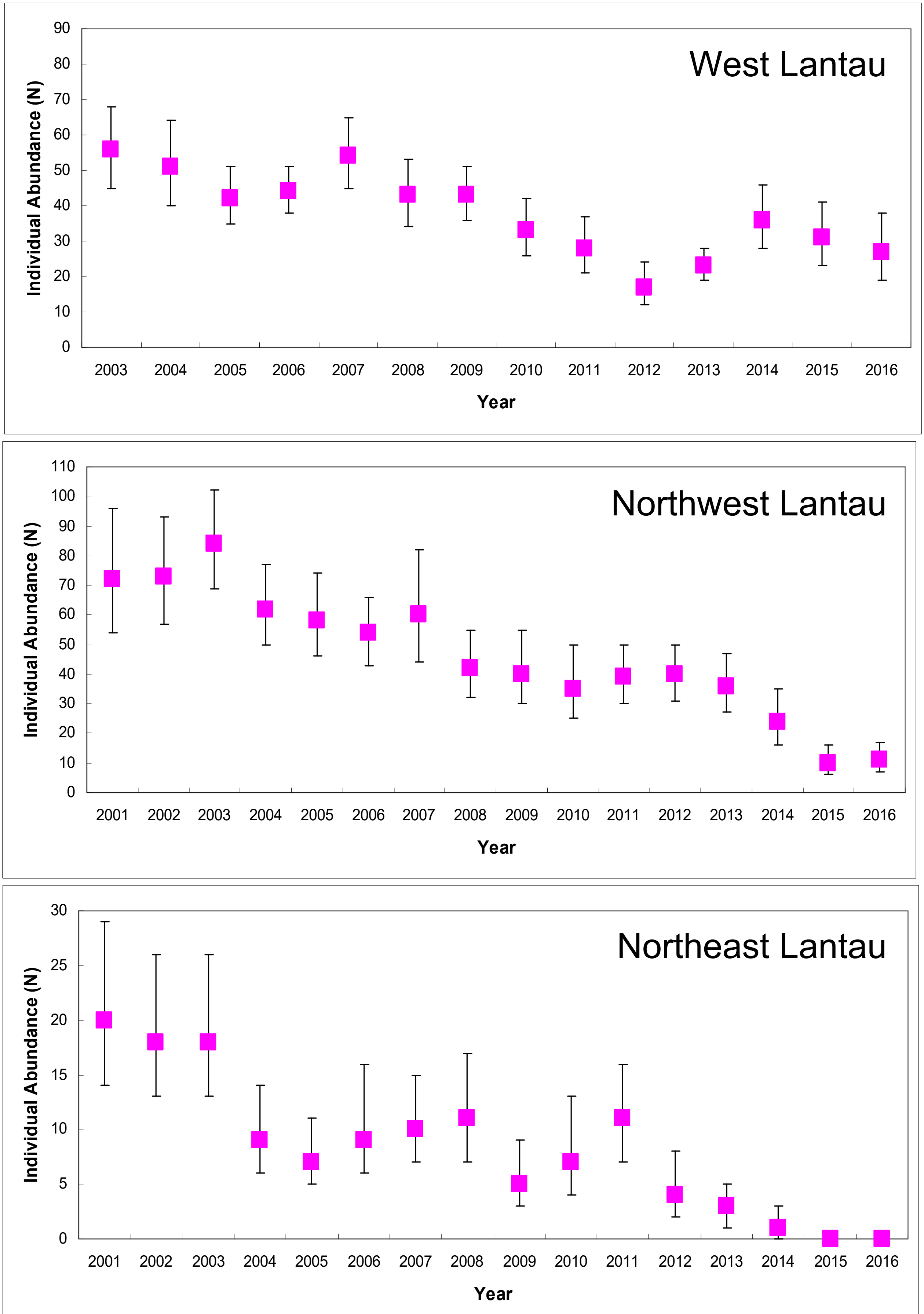


Figure 39. Temporal trends in annual abundance estimates of Chinese white dolphins in WL, NWL & NEL from 2001-16 (error bars: 95% confidence interval of abundance estimates)

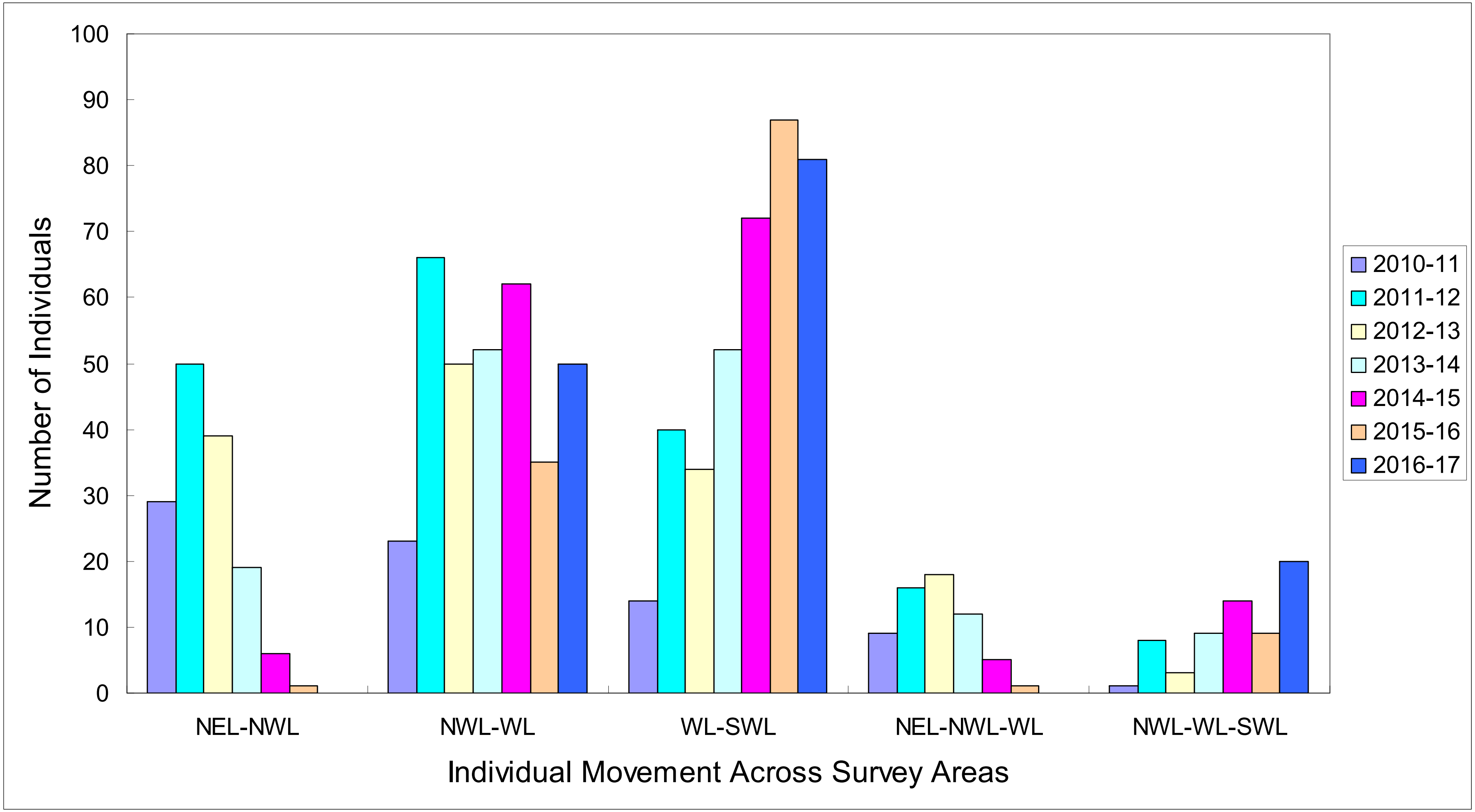


Figure 40. Temporal trends in number of individual dolphins involved in movements across different survey areas around Lantau in the past six monitoring periods

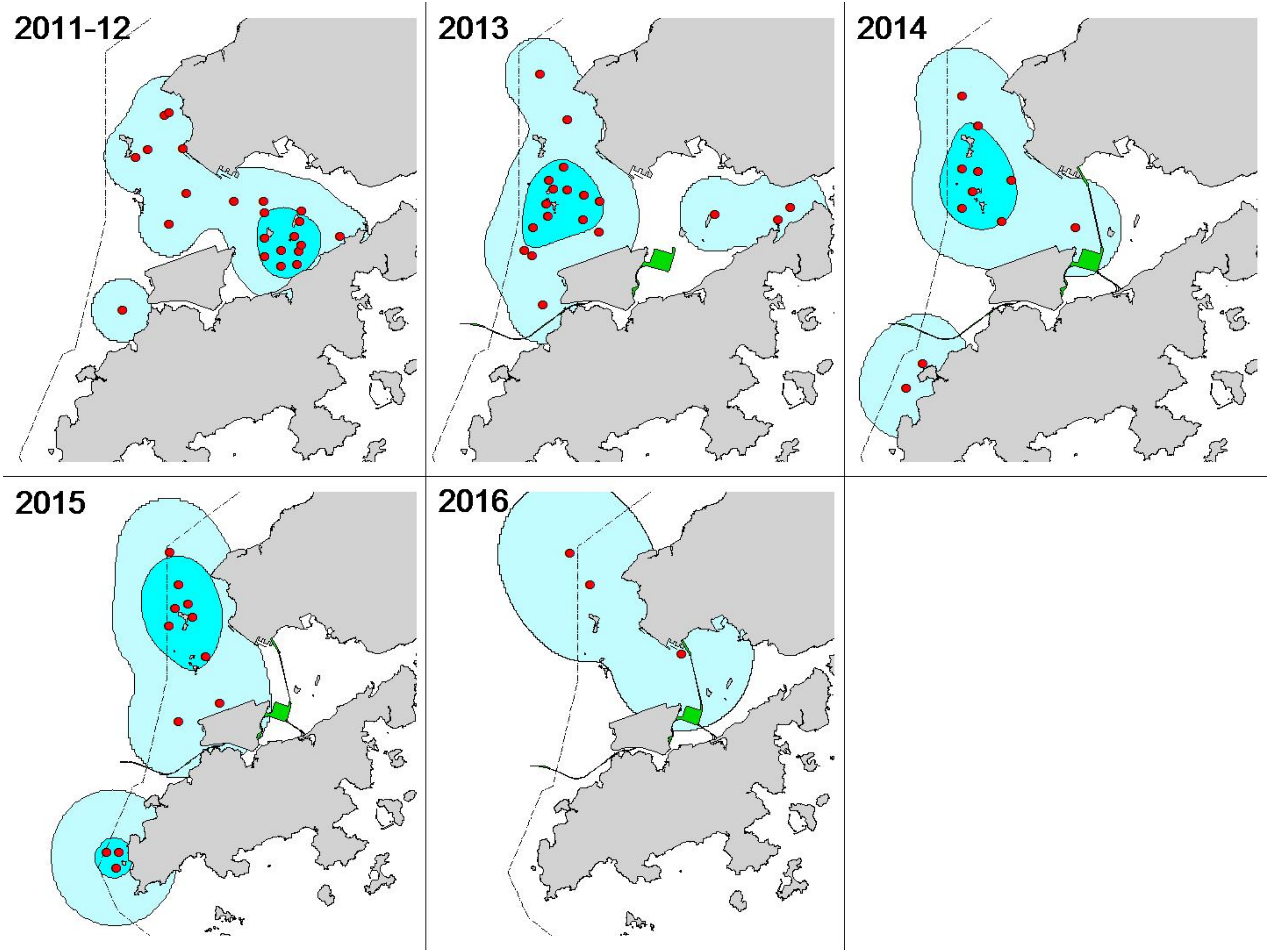


Figure 41. Temporal changes in range use of NL284 as an example of individuals from the northern social cluster which have utilized Lantau waters progressively less during 2011-16

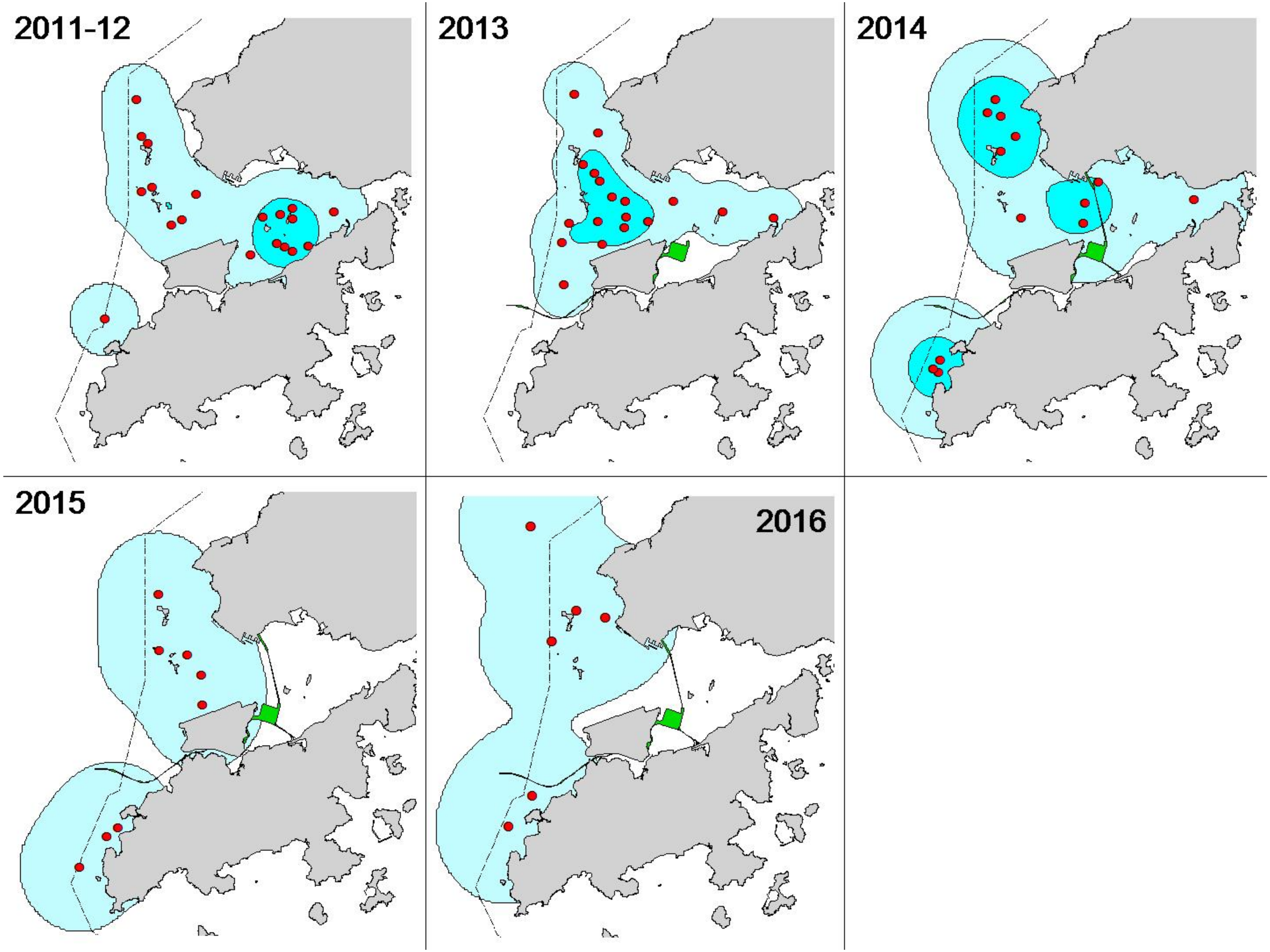


Figure 42. Temporal changes in range use of NL261 as an example of individuals from the northern social cluster which have shifted their ranges away from Northeast Lantau waters during 2011-16

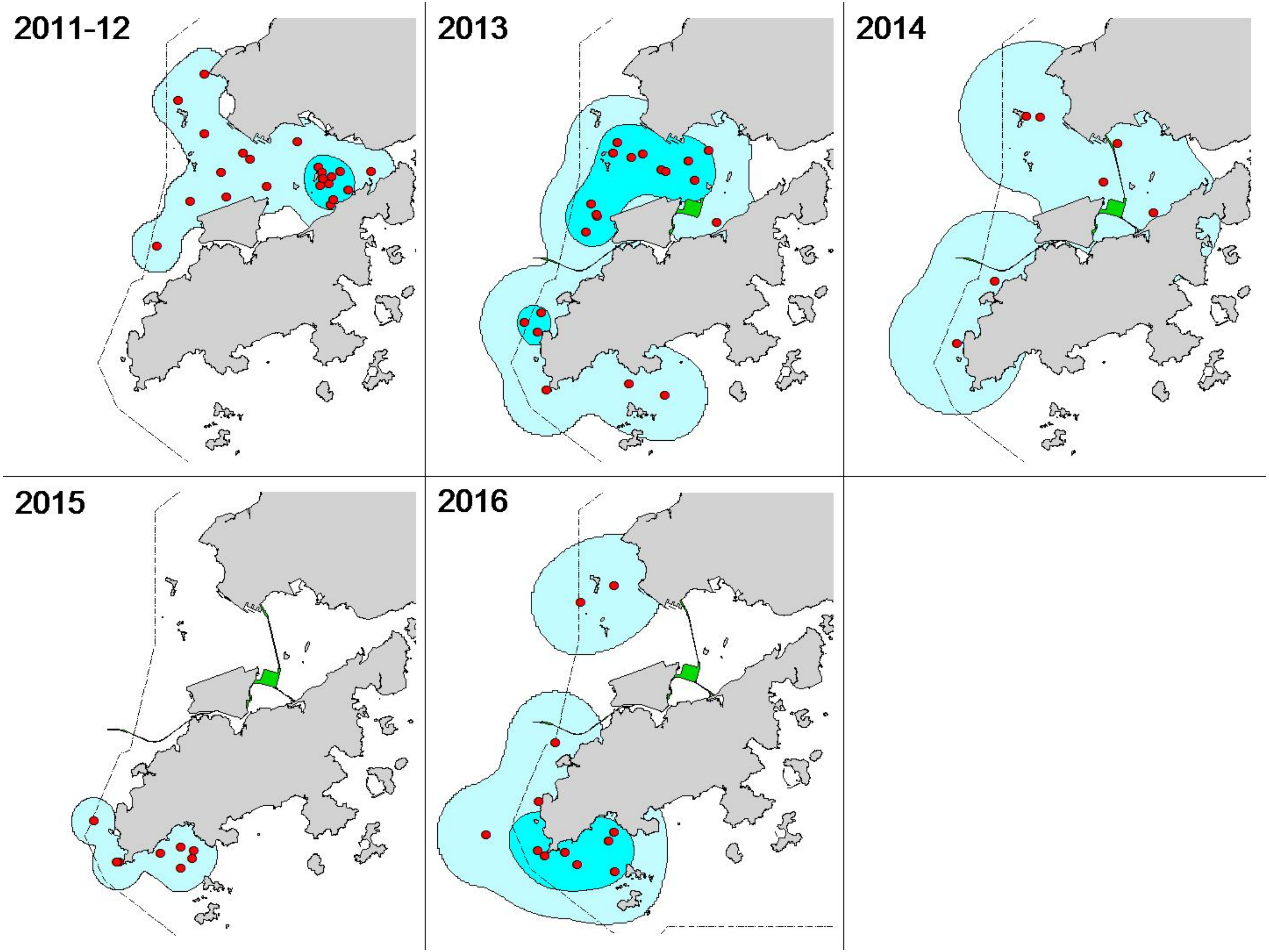


Figure 43. Temporal changes in range use of NL120 as an example of individuals which have shifted their ranges from North Lantau waters to Southwest Lantau waters during 2011-16

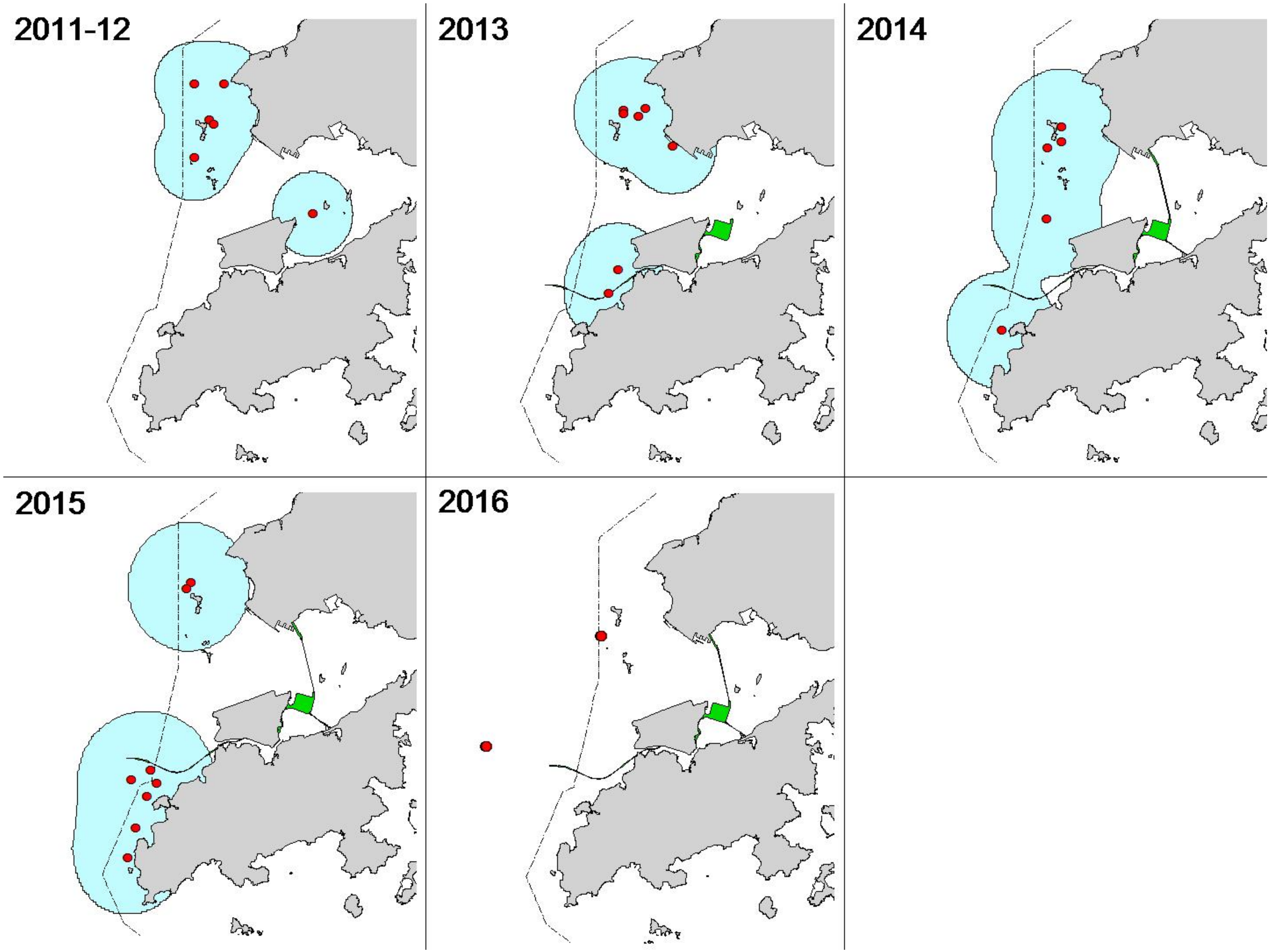


Figure 44. Temporal changes in range use of NL145 as an example of individuals which shifted their ranges from North Lantau waters to West Lantau waters during 2011-15, but have reversed such shifts in 2016

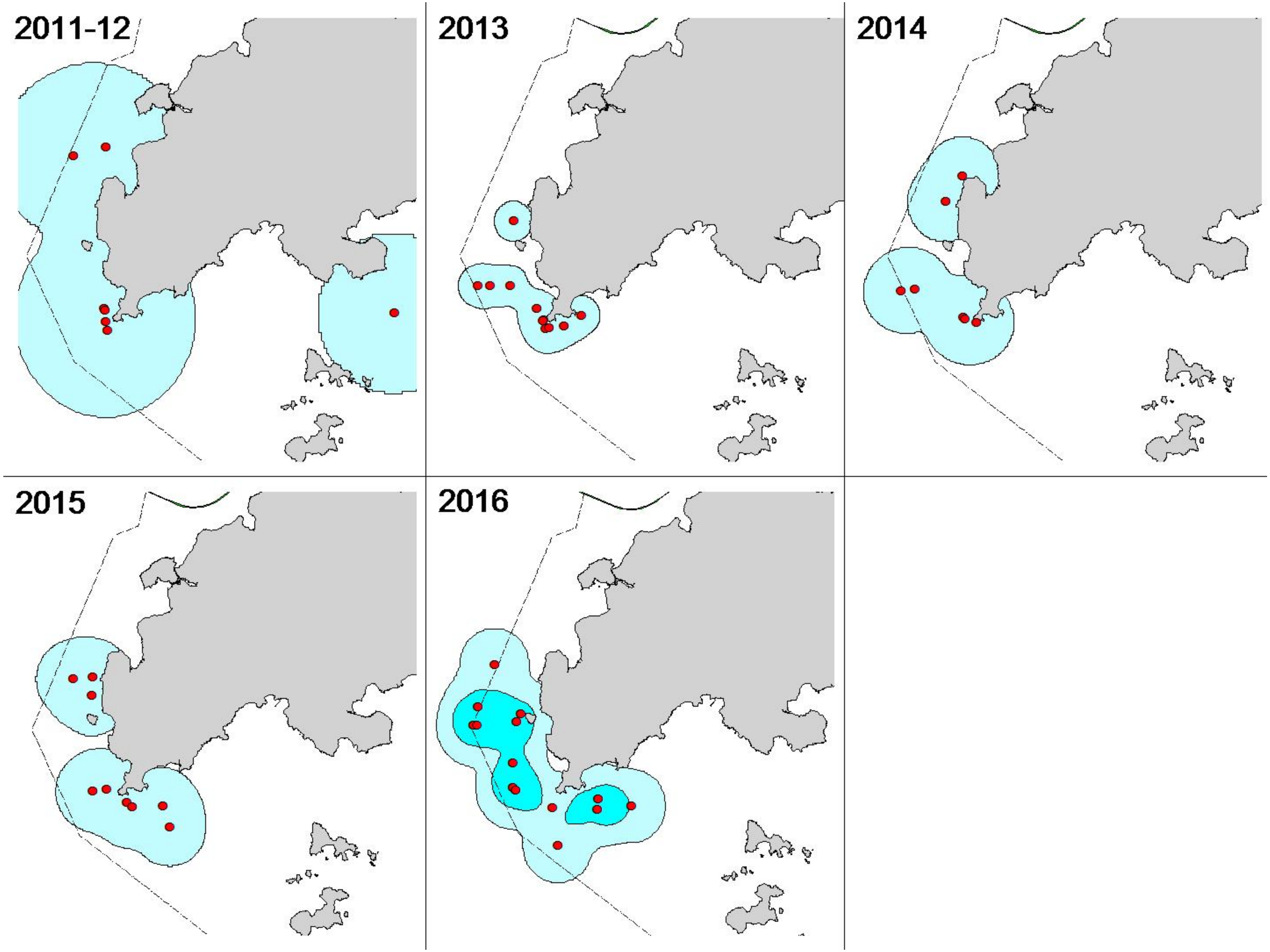


Figure 45. Temporal changes in range use of WL94 as an example of individuals from the southern social cluster which have utilized Lantau waters progressively more during 2011-16

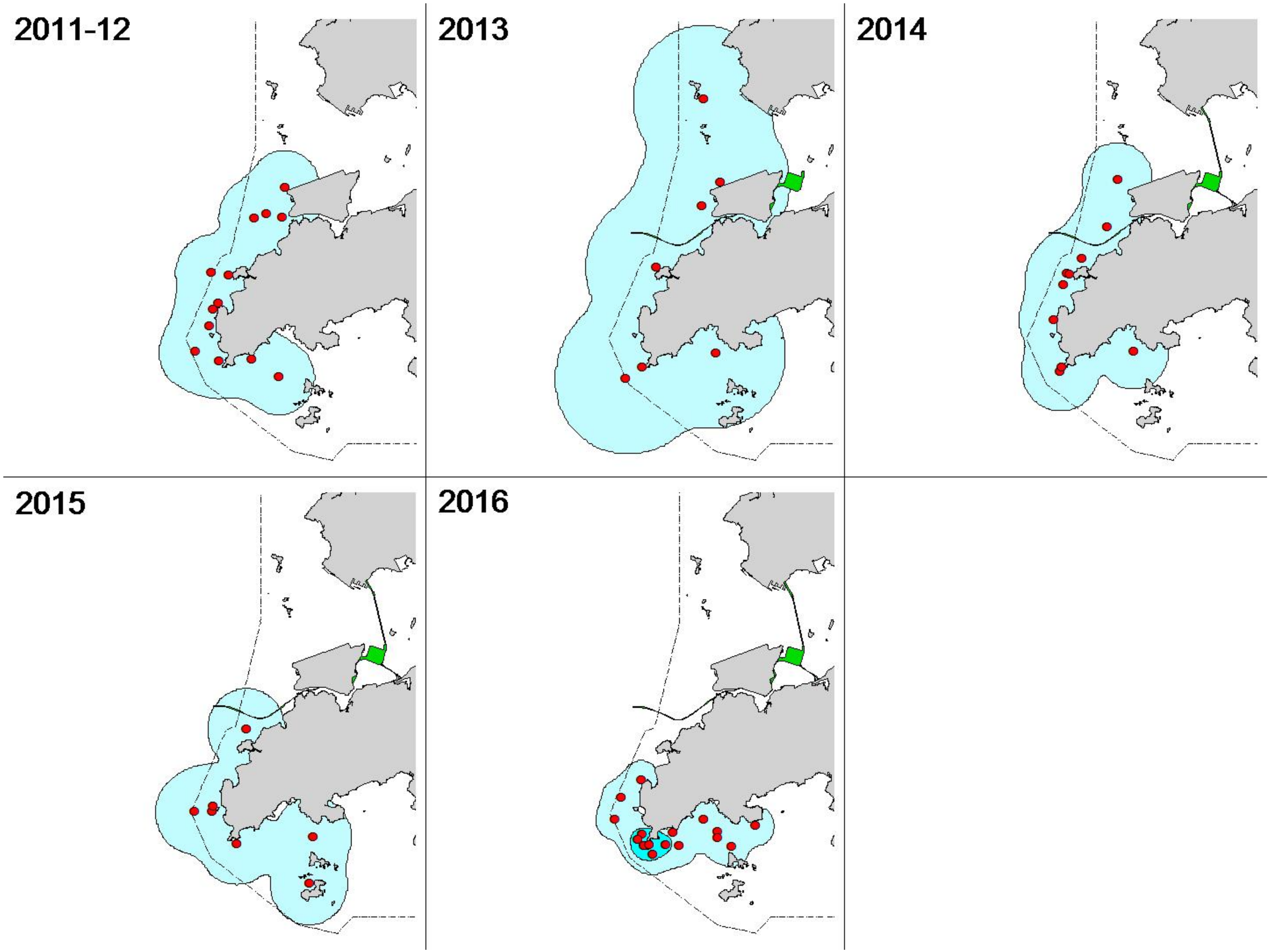


Figure 46. Temporal changes in range use of WL15 as an example of individuals from the southern social cluster which have avoided the HKLR alignment in recent years and shifted their ranges further south

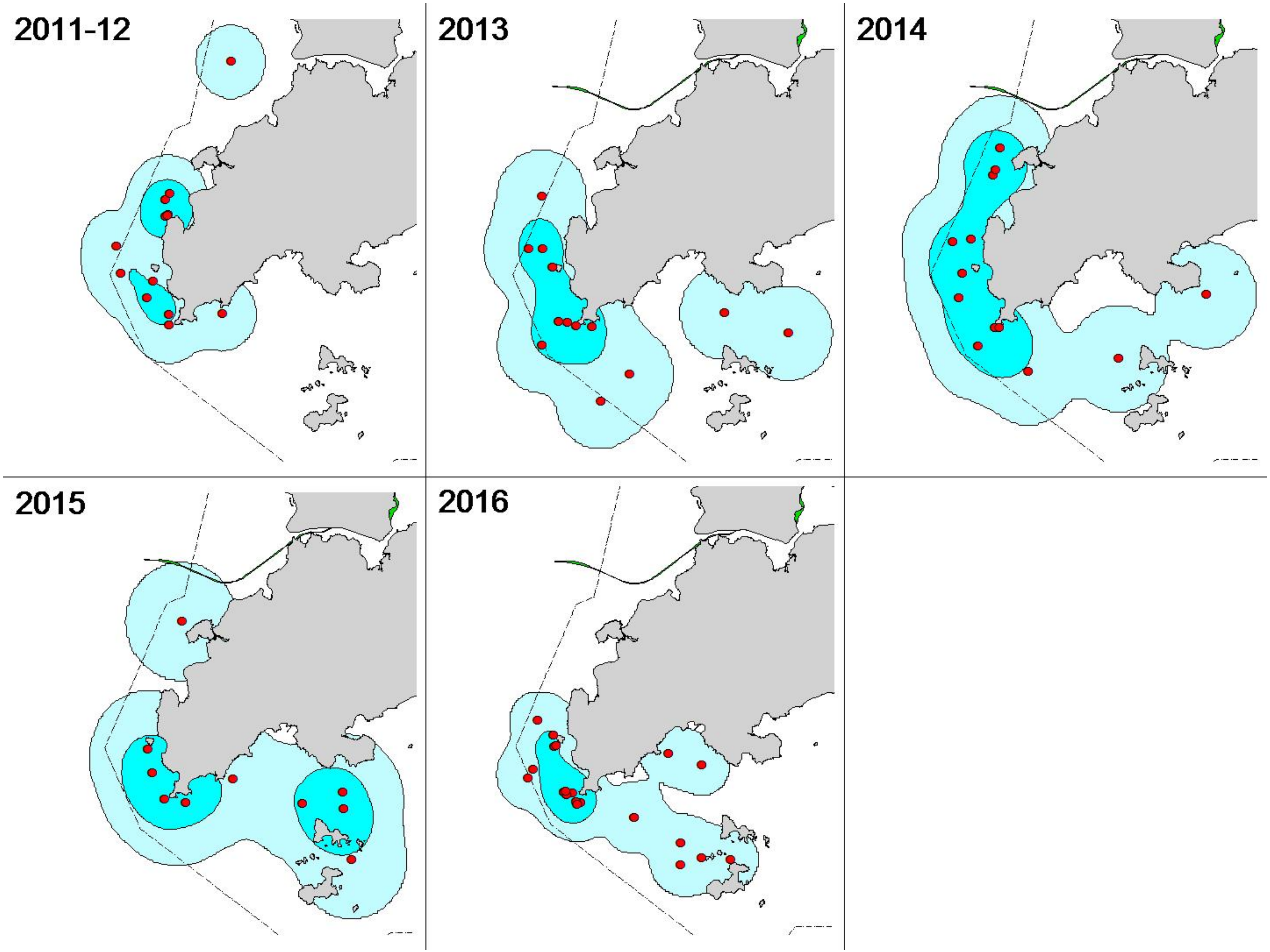


Figure 47. Temporal changes in range use of WL123 as an example of individuals from the southern social cluster which have clearly shifted their range use from West Lantau to Southwest Lantau waters during 2011-16

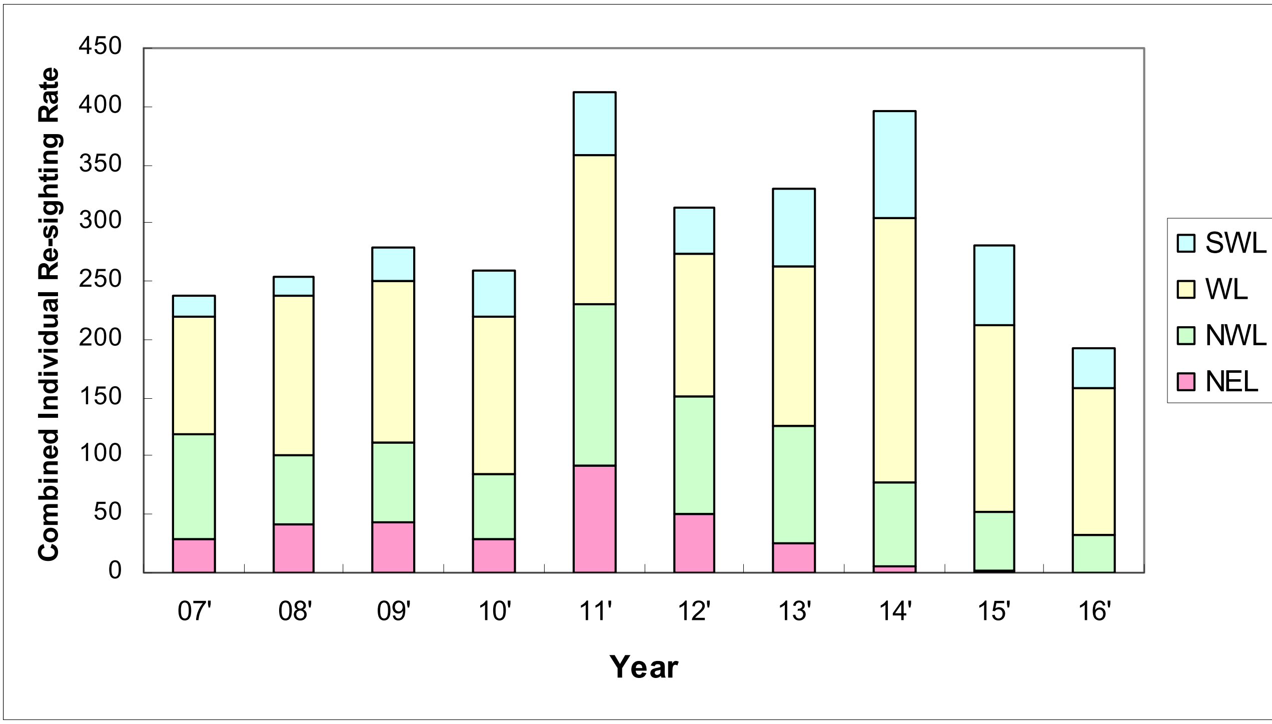


Figure 48a. Combined Individual Re-sighting Rate (total no. of individual re-sightings per 1,000 km of survey effort) of 94 individual dolphins (with 30+ re-sightings) among four survey areas during 2007-2016

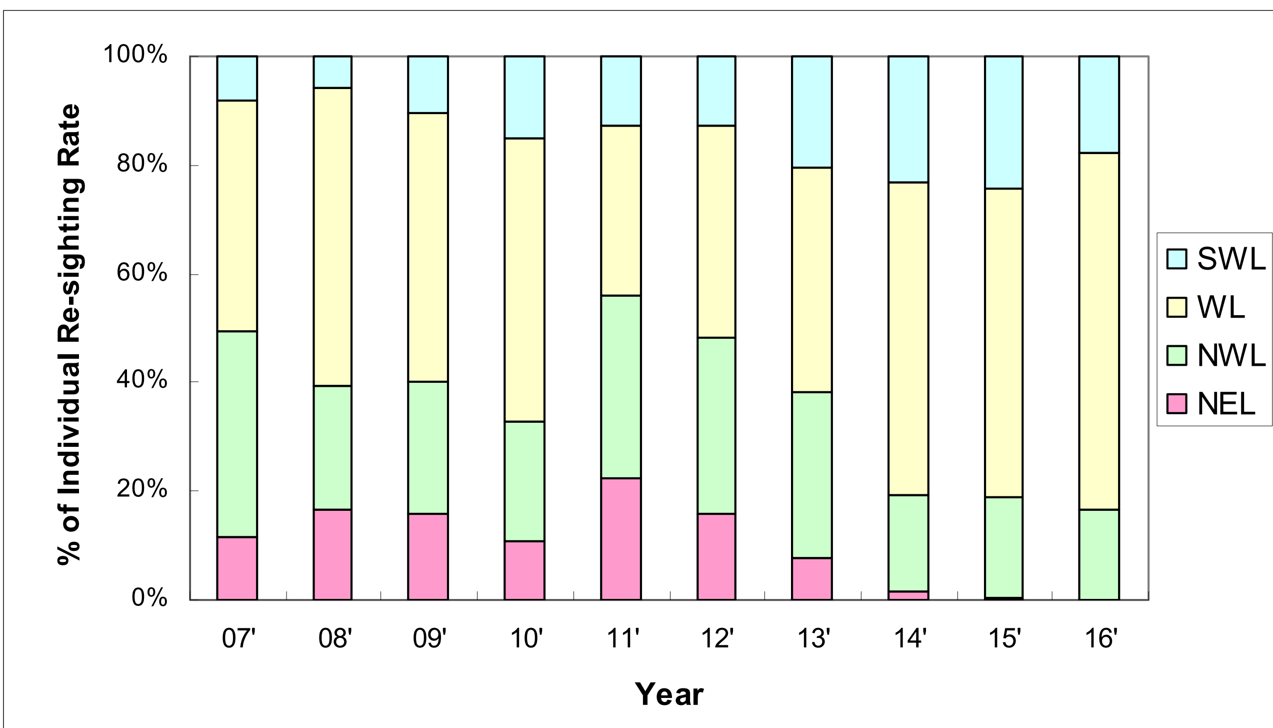


Figure 48b. Proportion of Combined Individual Re-sighting Rate of the total among four survey areas during 2007-2016 based on 94 individual dolphins with 30+ re-sightings

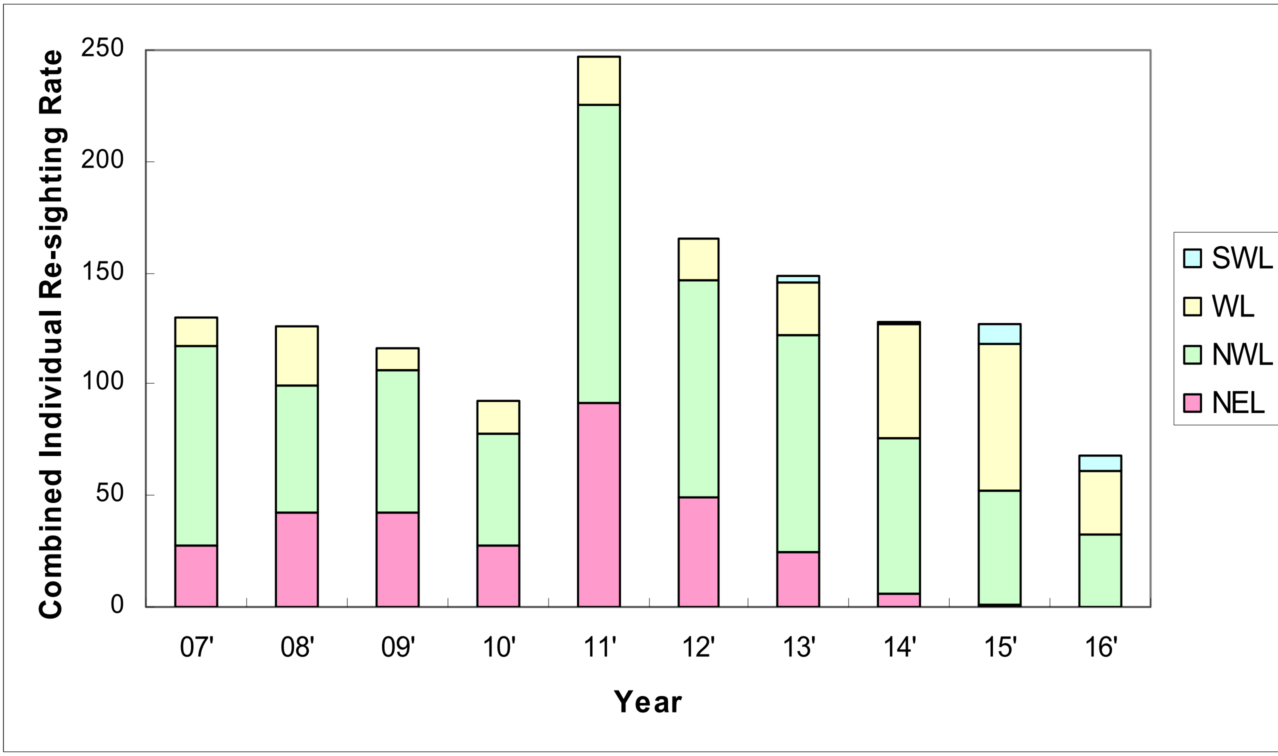


Figure 49a. Combined Individual Re-sighting Rate (total no. of individual re-sightings per 1,000 km of survey effort) of 52 individual dolphins (from northern social cluster) among four survey areas during 2007-2016

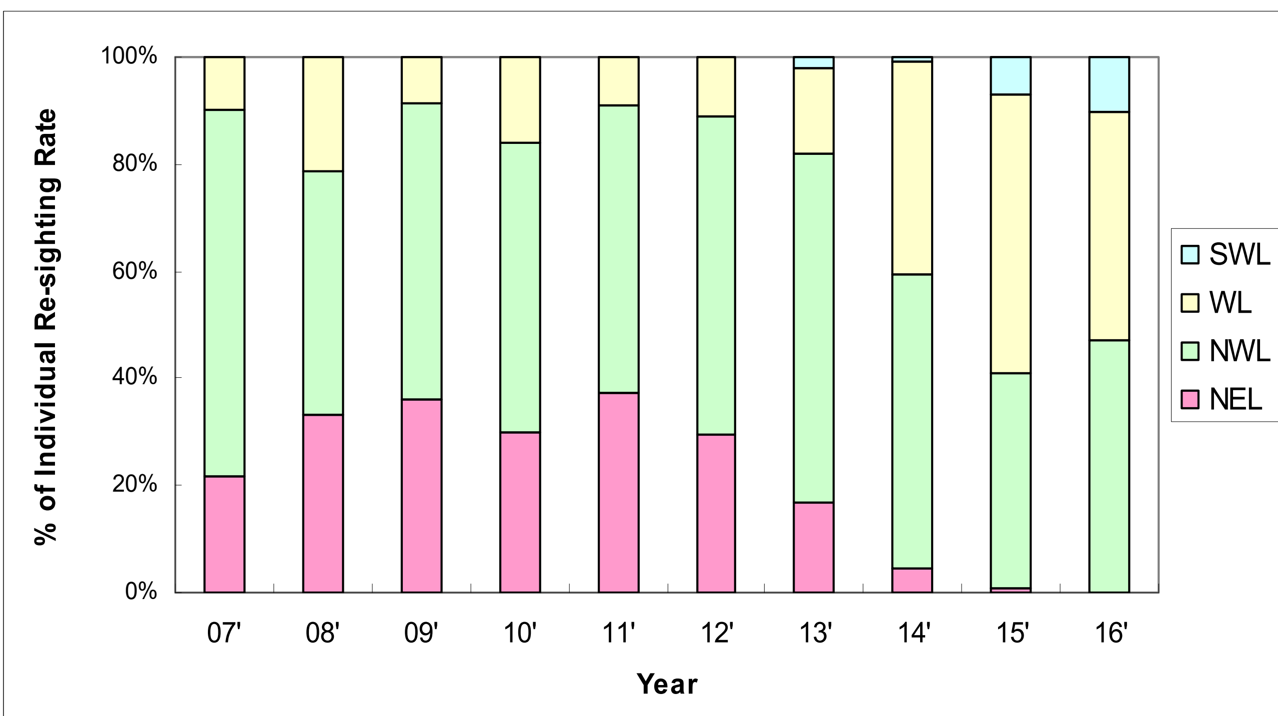


Figure 49b. Proportion of Combined Individual Re-sighting Rate of the total among four survey areas during 2007-2016 based on 52 individual dolphins from northern social cluster

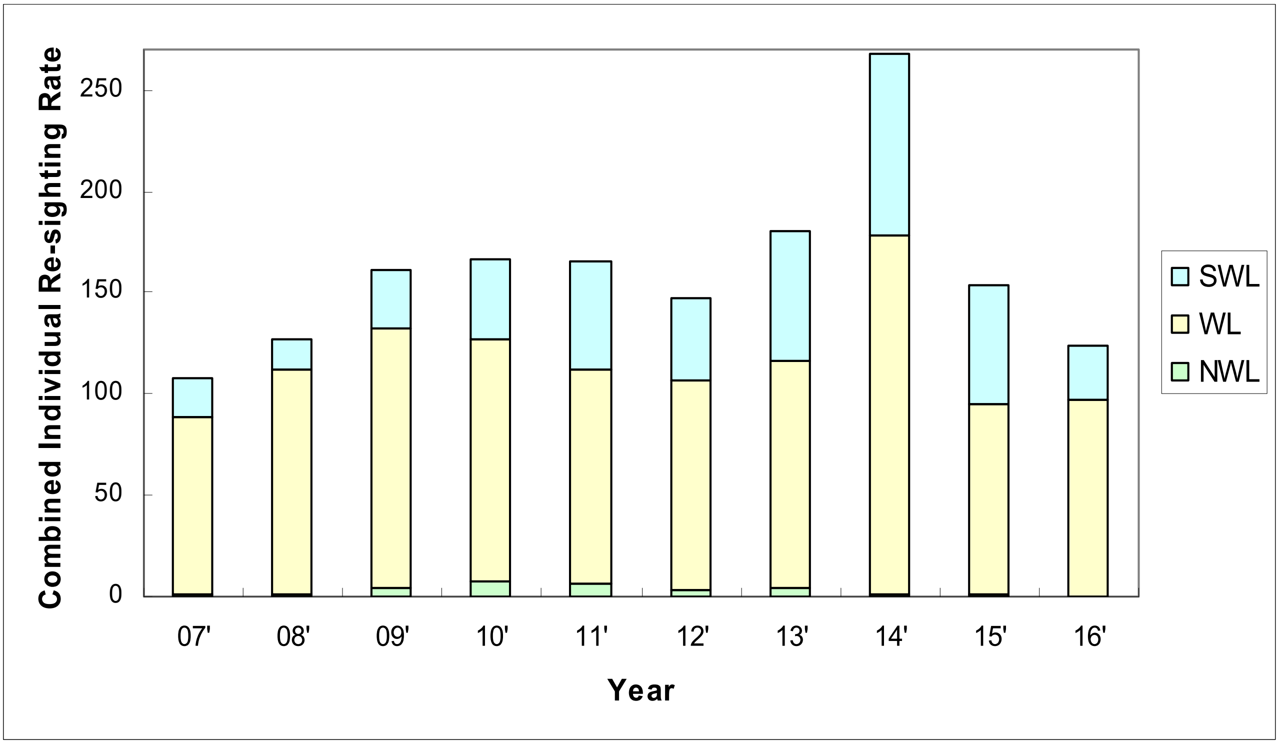


Figure 50a. Combined Individual Re-sighting Rate (total no. of individual re-sightings per 1,000 km of survey effort) of 42 individual dolphins (from southern social cluster) among four survey areas during 2007-2016

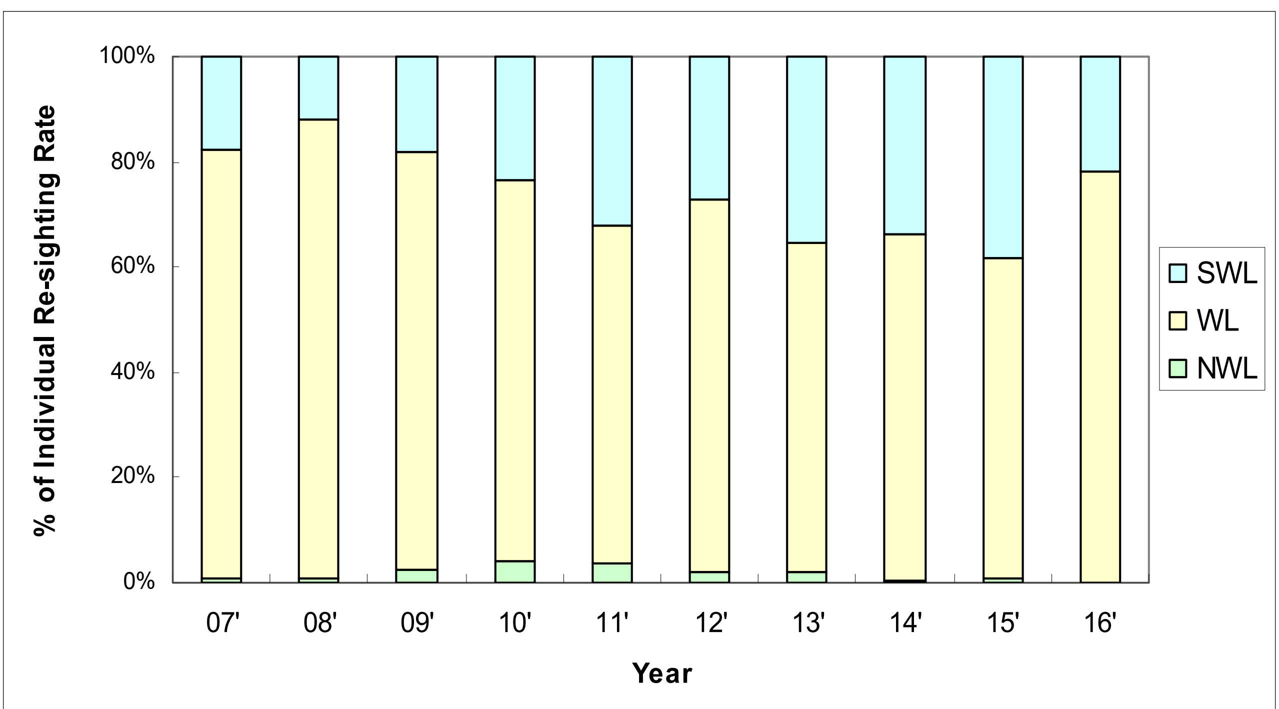


Figure 50b. Proportion of Combined Individual Re-sighting Rate of the total among four survey areas during 2007-2016 based on 42 individual dolphins from southern social cluster

Appendix I. HKCRP-AFCD Survey Effort Database (April 2016 - March 2017)

(Note: P = Primary Line Effort; S = Secondary Line Effort)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	P/S
1-Apr-16	SE LANTAU	1	16.24	SPRING	STANDARD31516	P
1-Apr-16	SE LANTAU	2	10.23	SPRING	STANDARD31516	P
1-Apr-16	SE LANTAU	1	4.82	SPRING	STANDARD31516	S
1-Apr-16	SE LANTAU	2	2.98	SPRING	STANDARD31516	S
1-Apr-16	LAMMA	1	2.92	SPRING	STANDARD31516	P
1-Apr-16	LAMMA	2	28.97	SPRING	STANDARD31516	P
1-Apr-16	LAMMA	0	0.97	SPRING	STANDARD31516	S
1-Apr-16	LAMMA	1	3.74	SPRING	STANDARD31516	S
1-Apr-16	LAMMA	2	4.33	SPRING	STANDARD31516	S
6-Apr-16	W LANTAU	2	2.10	SPRING	STANDARD31516	S
6-Apr-16	W LANTAU	3	2.78	SPRING	STANDARD31516	S
6-Apr-16	W LANTAU	4	2.09	SPRING	STANDARD31516	S
6-Apr-16	SW LANTAU	1	0.92	SPRING	STANDARD31516	S
6-Apr-16	SW LANTAU	2	6.21	SPRING	STANDARD31516	S
6-Apr-16	SW LANTAU	3	0.33	SPRING	STANDARD31516	S
6-Apr-16	SE LANTAU	2	15.01	SPRING	STANDARD31516	P
6-Apr-16	SE LANTAU	3	0.70	SPRING	STANDARD31516	P
6-Apr-16	SE LANTAU	2	6.39	SPRING	STANDARD31516	S
7-Apr-16	SW LANTAU	2	3.67	SPRING	STANDARD31516	P
7-Apr-16	SW LANTAU	3	4.16	SPRING	STANDARD31516	P
7-Apr-16	SW LANTAU	2	2.27	SPRING	STANDARD31516	S
8-Apr-16	LAMMA	0	1.16	SPRING	STANDARD31516	P
8-Apr-16	LAMMA	1	55.24	SPRING	STANDARD31516	P
8-Apr-16	LAMMA	2	22.27	SPRING	STANDARD31516	P
8-Apr-16	LAMMA	0	2.01	SPRING	STANDARD31516	S
8-Apr-16	LAMMA	1	9.47	SPRING	STANDARD31516	S
8-Apr-16	LAMMA	2	7.04	SPRING	STANDARD31516	S
14-Apr-16	NW LANTAU	2	24.78	SPRING	STANDARD31516	P
14-Apr-16	NW LANTAU	3	1.16	SPRING	STANDARD31516	P
14-Apr-16	NW LANTAU	2	1.46	SPRING	STANDARD31516	S
14-Apr-16	DEEP BAY	1	1.50	SPRING	STANDARD31516	P
14-Apr-16	DEEP BAY	2	11.72	SPRING	STANDARD31516	P
14-Apr-16	DEEP BAY	1	5.36	SPRING	STANDARD31516	S
14-Apr-16	DEEP BAY	2	2.02	SPRING	STANDARD31516	S
14-Apr-16	W LANTAU	2	8.87	SPRING	STANDARD31516	P
14-Apr-16	W LANTAU	3	5.90	SPRING	STANDARD31516	P
14-Apr-16	W LANTAU	1	1.82	SPRING	STANDARD31516	S
14-Apr-16	W LANTAU	2	12.31	SPRING	STANDARD31516	S
14-Apr-16	W LANTAU	3	7.03	SPRING	STANDARD31516	S
20-Apr-16	SW LANTAU	2	6.30	SPRING	STANDARD31516	P
20-Apr-16	SW LANTAU	3	4.88	SPRING	STANDARD31516	P
20-Apr-16	SW LANTAU	4	2.01	SPRING	STANDARD31516	P
20-Apr-16	SW LANTAU	2	4.19	SPRING	STANDARD31516	S
20-Apr-16	SW LANTAU	3	6.42	SPRING	STANDARD31516	S
22-Apr-16	W LANTAU	1	2.99	SPRING	STANDARD31516	S
22-Apr-16	W LANTAU	2	7.61	SPRING	STANDARD31516	S
26-Apr-16	NE LANTAU	2	9.53	SPRING	STANDARD31516	P
26-Apr-16	NE LANTAU	3	1.10	SPRING	STANDARD31516	P
26-Apr-16	NE LANTAU	2	8.47	SPRING	STANDARD31516	S
26-Apr-16	NE LANTAU	3	2.10	SPRING	STANDARD31516	S
26-Apr-16	W LANTAU	2	6.95	SPRING	STANDARD31516	P
26-Apr-16	W LANTAU	3	13.89	SPRING	STANDARD31516	P
26-Apr-16	W LANTAU	4	1.06	SPRING	STANDARD31516	P
26-Apr-16	W LANTAU	2	4.78	SPRING	STANDARD31516	S
26-Apr-16	W LANTAU	3	15.84	SPRING	STANDARD31516	S

Appendix I. (cont'd.)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	P/S
27-Apr-16	SE LANTAU	1	13.90	SPRING	STANDARD31516	P
27-Apr-16	SE LANTAU	2	11.17	SPRING	STANDARD31516	P
27-Apr-16	SE LANTAU	1	1.79	SPRING	STANDARD31516	S
27-Apr-16	SE LANTAU	2	9.93	SPRING	STANDARD31516	S
27-Apr-16	SW LANTAU	2	18.35	SPRING	STANDARD31516	P
27-Apr-16	SW LANTAU	3	0.85	SPRING	STANDARD31516	P
27-Apr-16	SW LANTAU	2	8.04	SPRING	STANDARD31516	S
4-May-16	W LANTAU	2	12.40	SPRING	STANDARD31516	P
4-May-16	W LANTAU	3	0.53	SPRING	STANDARD31516	P
4-May-16	W LANTAU	2	16.90	SPRING	STANDARD31516	S
4-May-16	W LANTAU	3	2.68	SPRING	STANDARD31516	S
4-May-16	SW LANTAU	1	1.17	SPRING	STANDARD31516	P
4-May-16	SW LANTAU	2	13.15	SPRING	STANDARD31516	P
4-May-16	SW LANTAU	3	4.71	SPRING	STANDARD31516	P
4-May-16	SW LANTAU	0	0.90	SPRING	STANDARD31516	S
4-May-16	SW LANTAU	2	5.61	SPRING	STANDARD31516	S
4-May-16	SW LANTAU	3	3.20	SPRING	STANDARD31516	S
5-May-16	LAMMA	1	18.25	SPRING	STANDARD31516	P
5-May-16	LAMMA	2	67.99	SPRING	STANDARD31516	P
5-May-16	LAMMA	3	3.17	SPRING	STANDARD31516	P
5-May-16	LAMMA	1	5.63	SPRING	STANDARD31516	S
5-May-16	LAMMA	2	12.28	SPRING	STANDARD31516	S
6-May-16	W LANTAU	2	1.71	SPRING	STANDARD31516	S
6-May-16	W LANTAU	3	8.69	SPRING	STANDARD31516	S
11-May-16	SE LANTAU	2	17.51	SPRING	STANDARD31516	P
11-May-16	SE LANTAU	3	5.59	SPRING	STANDARD31516	P
11-May-16	SE LANTAU	4	3.81	SPRING	STANDARD31516	P
11-May-16	SE LANTAU	2	8.72	SPRING	STANDARD31516	S
11-May-16	SE LANTAU	3	5.63	SPRING	STANDARD31516	S
11-May-16	SE LANTAU	4	3.76	SPRING	STANDARD31516	S
11-May-16	SW LANTAU	2	15.29	SPRING	STANDARD31516	P
11-May-16	SW LANTAU	2	11.43	SPRING	STANDARD31516	S
18-May-16	W LANTAU	2	6.80	SPRING	STANDARD31516	P
18-May-16	W LANTAU	3	1.42	SPRING	STANDARD31516	P
18-May-16	W LANTAU	2	5.84	SPRING	STANDARD31516	S
18-May-16	W LANTAU	3	1.27	SPRING	STANDARD31516	S
18-May-16	SW LANTAU	3	6.26	SPRING	STANDARD31516	P
18-May-16	SW LANTAU	4	2.20	SPRING	STANDARD31516	P
18-May-16	SW LANTAU	3	5.38	SPRING	STANDARD31516	S
18-May-16	SW LANTAU	4	1.46	SPRING	STANDARD31516	S
18-May-16	SE LANTAU	2	1.66	SPRING	STANDARD31516	P
18-May-16	SE LANTAU	3	4.92	SPRING	STANDARD31516	P
18-May-16	SE LANTAU	2	1.98	SPRING	STANDARD31516	S
18-May-16	SE LANTAU	4	0.50	SPRING	STANDARD31516	S
20-May-16	NW LANTAU	2	16.12	SPRING	STANDARD31516	P
20-May-16	NW LANTAU	3	15.68	SPRING	STANDARD31516	P
20-May-16	NW LANTAU	2	5.40	SPRING	STANDARD31516	S
20-May-16	DEEP BAY	2	11.11	SPRING	STANDARD31516	P
20-May-16	DEEP BAY	3	2.03	SPRING	STANDARD31516	P
20-May-16	DEEP BAY	2	4.73	SPRING	STANDARD31516	S
20-May-16	DEEP BAY	3	2.09	SPRING	STANDARD31516	S
20-May-16	NE LANTAU	1	1.10	SPRING	STANDARD31516	P
20-May-16	NE LANTAU	2	18.36	SPRING	STANDARD31516	P
20-May-16	NE LANTAU	2	11.14	SPRING	STANDARD31516	S
23-May-16	LAMMA	1	4.63	SPRING	STANDARD31516	P
23-May-16	LAMMA	2	50.47	SPRING	STANDARD31516	P
23-May-16	LAMMA	3	21.94	SPRING	STANDARD31516	P
23-May-16	LAMMA	1	0.66	SPRING	STANDARD31516	S

Appendix I. (cont'd.)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	P/S
23-May-16	LAMMA	2	13.54	SPRING	STANDARD31516	S
23-May-16	LAMMA	3	1.02	SPRING	STANDARD31516	S
30-May-16	SE LANTAU	2	11.63	SPRING	STANDARD31516	P
30-May-16	SE LANTAU	3	15.00	SPRING	STANDARD31516	P
30-May-16	SE LANTAU	2	4.40	SPRING	STANDARD31516	S
30-May-16	SE LANTAU	3	4.07	SPRING	STANDARD31516	S
30-May-16	SW LANTAU	2	5.46	SPRING	STANDARD31516	P
30-May-16	SW LANTAU	3	9.84	SPRING	STANDARD31516	P
30-May-16	SW LANTAU	4	5.54	SPRING	STANDARD31516	P
30-May-16	SW LANTAU	3	6.36	SPRING	STANDARD31516	S
31-May-16	NW LANTAU	2	3.51	SPRING	STANDARD31516	P
31-May-16	NW LANTAU	3	16.04	SPRING	STANDARD31516	P
31-May-16	NW LANTAU	4	7.62	SPRING	STANDARD31516	P
31-May-16	NW LANTAU	3	5.89	SPRING	STANDARD31516	S
31-May-16	NW LANTAU	4	1.14	SPRING	STANDARD31516	S
31-May-16	DEEP BAY	3	8.75	SPRING	STANDARD31516	P
31-May-16	DEEP BAY	4	4.13	SPRING	STANDARD31516	P
31-May-16	DEEP BAY	3	5.25	SPRING	STANDARD31516	S
31-May-16	DEEP BAY	4	0.87	SPRING	STANDARD31516	S
31-May-16	NE LANTAU	2	18.42	SPRING	STANDARD31516	P
31-May-16	NE LANTAU	3	4.40	SPRING	STANDARD31516	P
31-May-16	NE LANTAU	2	10.08	SPRING	STANDARD31516	S
3-Jun-16	W LANTAU	3	1.84	SUMMER	STANDARD31516	S
3-Jun-16	W LANTAU	4	10.42	SUMMER	STANDARD31516	S
3-Jun-16	W LANTAU	5	0.74	SUMMER	STANDARD31516	S
3-Jun-16	SW LANTAU	2	10.81	SUMMER	STANDARD31516	P
3-Jun-16	SW LANTAU	3	11.09	SUMMER	STANDARD31516	P
3-Jun-16	SW LANTAU	2	2.60	SUMMER	STANDARD31516	S
3-Jun-16	SW LANTAU	3	11.32	SUMMER	STANDARD31516	S
3-Jun-16	SE LANTAU	2	2.63	SUMMER	STANDARD31516	P
3-Jun-16	SE LANTAU	3	6.47	SUMMER	STANDARD31516	P
3-Jun-16	SE LANTAU	2	1.96	SUMMER	STANDARD31516	S
3-Jun-16	SE LANTAU	3	1.14	SUMMER	STANDARD31516	S
7-Jun-16	W LANTAU	2	9.04	SUMMER	STANDARD31516	S
8-Jun-16	W LANTAU	1	2.51	SUMMER	STANDARD31516	S
8-Jun-16	W LANTAU	2	7.25	SUMMER	STANDARD31516	S
8-Jun-16	W LANTAU	3	0.76	SUMMER	STANDARD31516	S
14-Jun-16	SE LANTAU	2	2.05	SUMMER	STANDARD31516	P
14-Jun-16	SE LANTAU	3	6.48	SUMMER	STANDARD31516	P
14-Jun-16	SE LANTAU	4	4.14	SUMMER	STANDARD31516	P
14-Jun-16	SE LANTAU	2	0.93	SUMMER	STANDARD31516	S
14-Jun-16	SE LANTAU	3	3.50	SUMMER	STANDARD31516	S
14-Jun-16	SE LANTAU	4	2.00	SUMMER	STANDARD31516	S
14-Jun-16	SW LANTAU	2	6.20	SUMMER	STANDARD31516	P
14-Jun-16	SW LANTAU	3	12.92	SUMMER	STANDARD31516	P
14-Jun-16	SW LANTAU	4	1.30	SUMMER	STANDARD31516	P
14-Jun-16	SW LANTAU	2	2.72	SUMMER	STANDARD31516	S
14-Jun-16	SW LANTAU	3	4.48	SUMMER	STANDARD31516	S
14-Jun-16	SW LANTAU	4	0.53	SUMMER	STANDARD31516	S
20-Jun-16	SW LANTAU	2	12.93	SUMMER	STANDARD31516	P
20-Jun-16	SW LANTAU	3	1.84	SUMMER	STANDARD31516	P
20-Jun-16	SW LANTAU	2	4.37	SUMMER	STANDARD31516	S
28-Jun-16	W LANTAU	2	9.25	SUMMER	STANDARD31516	P
28-Jun-16	W LANTAU	3	2.36	SUMMER	STANDARD31516	P
28-Jun-16	W LANTAU	2	11.19	SUMMER	STANDARD31516	S
28-Jun-16	W LANTAU	3	4.51	SUMMER	STANDARD31516	S

Appendix I. (cont'd.)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	P/S
28-Jun-16	W LANTAU	4	2.84	SUMMER	STANDARD31516	S
28-Jun-16	NW LANTAU	1	9.34	SUMMER	STANDARD31516	P
28-Jun-16	NW LANTAU	2	16.75	SUMMER	STANDARD31516	P
28-Jun-16	NW LANTAU	1	3.42	SUMMER	STANDARD31516	S
28-Jun-16	NW LANTAU	2	7.39	SUMMER	STANDARD31516	S
4-Jul-16	W LANTAU	2	1.27	SUMMER	STANDARD31516	P
4-Jul-16	W LANTAU	3	8.80	SUMMER	STANDARD31516	P
4-Jul-16	W LANTAU	4	4.07	SUMMER	STANDARD31516	P
4-Jul-16	W LANTAU	5	1.22	SUMMER	STANDARD31516	P
4-Jul-16	W LANTAU	2	0.77	SUMMER	STANDARD31516	S
4-Jul-16	W LANTAU	3	12.00	SUMMER	STANDARD31516	S
4-Jul-16	W LANTAU	4	7.90	SUMMER	STANDARD31516	S
4-Jul-16	W LANTAU	5	1.73	SUMMER	STANDARD31516	S
4-Jul-16	NE LANTAU	2	5.30	SUMMER	STANDARD31516	P
4-Jul-16	NE LANTAU	3	9.90	SUMMER	STANDARD31516	P
4-Jul-16	NE LANTAU	2	6.90	SUMMER	STANDARD31516	S
4-Jul-16	NE LANTAU	3	1.90	SUMMER	STANDARD31516	S
6-Jul-16	SW LANTAU	1	1.70	SUMMER	STANDARD31516	P
6-Jul-16	SW LANTAU	2	3.46	SUMMER	STANDARD31516	P
6-Jul-16	SW LANTAU	3	1.45	SUMMER	STANDARD31516	P
6-Jul-16	SW LANTAU	2	3.14	SUMMER	STANDARD31516	S
8-Jul-16	W LANTAU	2	2.85	SUMMER	STANDARD31516	P
8-Jul-16	W LANTAU	2	7.65	SUMMER	STANDARD31516	S
13-Jul-16	SW LANTAU	1	2.32	SUMMER	STANDARD31516	P
13-Jul-16	SW LANTAU	2	17.94	SUMMER	STANDARD31516	P
13-Jul-16	SW LANTAU	1	2.42	SUMMER	STANDARD31516	S
13-Jul-16	SW LANTAU	2	6.02	SUMMER	STANDARD31516	S
15-Jul-16	NINEPINS	2	11.36	SUMMER	STANDARD31516	P
15-Jul-16	NINEPINS	3	17.20	SUMMER	STANDARD31516	P
15-Jul-16	NINEPINS	3	5.34	SUMMER	STANDARD31516	S
15-Jul-16	PO TOI	2	2.09	SUMMER	STANDARD31516	P
15-Jul-16	PO TOI	3	18.17	SUMMER	STANDARD31516	P
15-Jul-16	PO TOI	4	18.00	SUMMER	STANDARD31516	P
15-Jul-16	PO TOI	3	9.54	SUMMER	STANDARD31516	S
15-Jul-16	PO TOI	4	6.10	SUMMER	STANDARD31516	S
19-Jul-16	SE LANTAU	2	5.89	SUMMER	STANDARD31516	P
19-Jul-16	SE LANTAU	3	7.04	SUMMER	STANDARD31516	P
19-Jul-16	SE LANTAU	4	1.84	SUMMER	STANDARD31516	P
19-Jul-16	SE LANTAU	2	0.50	SUMMER	STANDARD31516	S
19-Jul-16	SE LANTAU	3	6.52	SUMMER	STANDARD31516	S
19-Jul-16	SE LANTAU	4	2.11	SUMMER	STANDARD31516	S
19-Jul-16	SW LANTAU	2	4.95	SUMMER	STANDARD31516	P
19-Jul-16	SW LANTAU	3	11.97	SUMMER	STANDARD31516	P
19-Jul-16	SW LANTAU	2	3.23	SUMMER	STANDARD31516	S
19-Jul-16	SW LANTAU	3	7.70	SUMMER	STANDARD31516	S
19-Jul-16	SW LANTAU	4	1.10	SUMMER	STANDARD31516	S
22-Jul-16	PO TOI	1	4.46	SUMMER	STANDARD31516	P
22-Jul-16	PO TOI	2	34.56	SUMMER	STANDARD31516	P
22-Jul-16	PO TOI	3	22.60	SUMMER	STANDARD31516	P
22-Jul-16	PO TOI	2	10.98	SUMMER	STANDARD31516	S
22-Jul-16	NINEPINS	2	4.11	SUMMER	STANDARD31516	P
22-Jul-16	NINEPINS	3	3.37	SUMMER	STANDARD31516	P
25-Jul-16	SAI KUNG	1	6.44	SUMMER	STANDARD31516	P
25-Jul-16	SAI KUNG	2	42.86	SUMMER	STANDARD31516	P
25-Jul-16	SAI KUNG	1	2.09	SUMMER	STANDARD31516	S
25-Jul-16	SAI KUNG	2	4.00	SUMMER	STANDARD31516	S
25-Jul-16	NINEPINS	1	6.44	SUMMER	STANDARD31516	P
8-Aug-16	PO TOI	2	26.14	SUMMER	STANDARD31516	P
8-Aug-16	PO TOI	2	6.46	SUMMER	STANDARD31516	S
8-Aug-16	NINEPINS	2	25.40	SUMMER	STANDARD31516	P
8-Aug-16	NINEPINS	3	14.60	SUMMER	STANDARD31516	P

Appendix I. (cont'd.)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	P/S
8-Aug-16	NINEPINS	2	1.70	SUMMER	STANDARD31516	S
9-Aug-16	SW LANTAU	2	6.22	SUMMER	STANDARD31516	P
9-Aug-16	SW LANTAU	3	3.50	SUMMER	STANDARD31516	P
9-Aug-16	SW LANTAU	4	2.20	SUMMER	STANDARD31516	P
9-Aug-16	SW LANTAU	5	1.80	SUMMER	STANDARD31516	P
9-Aug-16	SW LANTAU	2	4.70	SUMMER	STANDARD31516	S
9-Aug-16	SW LANTAU	3	2.50	SUMMER	STANDARD31516	S
9-Aug-16	SW LANTAU	4	1.99	SUMMER	STANDARD31516	S
16-Aug-16	SW LANTAU	1	4.81	SUMMER	STANDARD36826	P
16-Aug-16	SW LANTAU	2	1.65	SUMMER	STANDARD36826	P
16-Aug-16	SW LANTAU	1	2.17	SUMMER	STANDARD36826	S
19-Aug-16	W LANTAU	2	9.96	SUMMER	STANDARD31516	P
19-Aug-16	W LANTAU	3	3.60	SUMMER	STANDARD31516	P
19-Aug-16	W LANTAU	2	9.14	SUMMER	STANDARD31516	S
19-Aug-16	W LANTAU	3	1.70	SUMMER	STANDARD31516	S
19-Aug-16	NW LANTAU	2	2.43	SUMMER	STANDARD31516	P
19-Aug-16	NW LANTAU	3	23.55	SUMMER	STANDARD31516	P
19-Aug-16	NW LANTAU	4	0.80	SUMMER	STANDARD31516	P
19-Aug-16	NW LANTAU	2	2.20	SUMMER	STANDARD31516	S
19-Aug-16	NW LANTAU	3	4.62	SUMMER	STANDARD31516	S
19-Aug-16	NW LANTAU	4	0.60	SUMMER	STANDARD31516	S
19-Aug-16	NE LANTAU	2	4.27	SUMMER	STANDARD31516	P
19-Aug-16	NE LANTAU	3	6.98	SUMMER	STANDARD31516	P
19-Aug-16	NE LANTAU	2	4.25	SUMMER	STANDARD31516	S
22-Aug-16	W LANTAU	2	8.76	SUMMER	STANDARD36826	S
22-Aug-16	W LANTAU	3	1.21	SUMMER	STANDARD36826	S
23-Aug-16	PO TOI	1	35.81	SUMMER	STANDARD36826	P
23-Aug-16	PO TOI	2	23.80	SUMMER	STANDARD36826	P
23-Aug-16	PO TOI	1	2.69	SUMMER	STANDARD36826	S
23-Aug-16	PO TOI	2	3.70	SUMMER	STANDARD36826	S
23-Aug-16	NINEPINS	2	24.80	SUMMER	STANDARD36826	P
25-Aug-16	W LANTAU	2	8.48	SUMMER	STANDARD36826	S
25-Aug-16	W LANTAU	3	0.85	SUMMER	STANDARD36826	S
25-Aug-16	SW LANTAU	2	19.93	SUMMER	STANDARD36826	P
25-Aug-16	SW LANTAU	2	10.27	SUMMER	STANDARD36826	S
25-Aug-16	SW LANTAU	3	1.30	SUMMER	STANDARD36826	S
25-Aug-16	SE LANTAU	2	13.55	SUMMER	STANDARD36826	P
25-Aug-16	SE LANTAU	3	16.20	SUMMER	STANDARD36826	P
25-Aug-16	SE LANTAU	2	4.35	SUMMER	STANDARD36826	S
25-Aug-16	SE LANTAU	3	1.70	SUMMER	STANDARD36826	S
29-Aug-16	NW LANTAU	2	34.77	SUMMER	STANDARD36826	P
29-Aug-16	NW LANTAU	3	4.30	SUMMER	STANDARD36826	P
29-Aug-16	NW LANTAU	2	8.33	SUMMER	STANDARD36826	S
29-Aug-16	NW LANTAU	3	4.90	SUMMER	STANDARD36826	S
29-Aug-16	NE LANTAU	2	27.66	SUMMER	STANDARD36826	P
29-Aug-16	NE LANTAU	3	1.30	SUMMER	STANDARD36826	P
29-Aug-16	NE LANTAU	1	2.30	SUMMER	STANDARD36826	S
29-Aug-16	NE LANTAU	2	8.04	SUMMER	STANDARD36826	S
31-Aug-16	NINEPINS	0	2.89	SUMMER	STANDARD36826	P
31-Aug-16	NINEPINS	1	28.99	SUMMER	STANDARD36826	P
31-Aug-16	NINEPINS	2	25.79	SUMMER	STANDARD36826	P
31-Aug-16	NINEPINS	1	2.31	SUMMER	STANDARD36826	S
31-Aug-16	NINEPINS	2	5.00	SUMMER	STANDARD36826	S
31-Aug-16	SAI KUNG	2	11.85	SUMMER	STANDARD36826	P
31-Aug-16	SAI KUNG	2	6.75	SUMMER	STANDARD36826	S
6-Sep-16	SE LANTAU	2	21.20	AUTUMN	STANDARD31516	P
6-Sep-16	SE LANTAU	3	1.50	AUTUMN	STANDARD31516	P
6-Sep-16	SE LANTAU	2	4.60	AUTUMN	STANDARD31516	S
6-Sep-16	SW LANTAU	1	4.40	AUTUMN	STANDARD31516	P
6-Sep-16	SW LANTAU	2	21.09	AUTUMN	STANDARD31516	P
6-Sep-16	SW LANTAU	1	3.80	AUTUMN	STANDARD31516	S

Appendix I. (cont'd.)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	P/S
6-Sep-16	SW LANTAU	2	5.44	AUTUMN	STANDARD31516	S
7-Sep-16	NE LANTAU	2	19.09	AUTUMN	STANDARD36826	P
7-Sep-16	NE LANTAU	3	2.60	AUTUMN	STANDARD36826	P
7-Sep-16	NE LANTAU	1	1.10	AUTUMN	STANDARD36826	S
7-Sep-16	NE LANTAU	2	9.71	AUTUMN	STANDARD36826	S
7-Sep-16	NW LANTAU	2	11.82	AUTUMN	STANDARD36826	P
7-Sep-16	NW LANTAU	3	18.15	AUTUMN	STANDARD36826	P
7-Sep-16	NW LANTAU	2	5.93	AUTUMN	STANDARD36826	S
7-Sep-16	DEEP BAY	2	6.11	AUTUMN	STANDARD36826	P
7-Sep-16	DEEP BAY	3	6.17	AUTUMN	STANDARD36826	P
7-Sep-16	DEEP BAY	2	3.04	AUTUMN	STANDARD36826	S
7-Sep-16	DEEP BAY	3	4.68	AUTUMN	STANDARD36826	S
19-Sep-16	W LANTAU	3	8.71	AUTUMN	STANDARD36826	S
19-Sep-16	W LANTAU	4	1.69	AUTUMN	STANDARD36826	S
20-Sep-16	W LANTAU	2	6.85	AUTUMN	STANDARD31516	S
20-Sep-16	W LANTAU	3	2.97	AUTUMN	STANDARD31516	S
20-Sep-16	NE LANTAU	1	1.50	AUTUMN	STANDARD31516	P
20-Sep-16	NE LANTAU	2	13.71	AUTUMN	STANDARD31516	P
20-Sep-16	NE LANTAU	1	1.70	AUTUMN	STANDARD31516	S
20-Sep-16	NE LANTAU	2	8.79	AUTUMN	STANDARD31516	S
22-Sep-16	SE LANTAU	2	8.01	AUTUMN	STANDARD31516	P
22-Sep-16	SE LANTAU	3	11.24	AUTUMN	STANDARD31516	P
22-Sep-16	SE LANTAU	2	4.60	AUTUMN	STANDARD31516	S
22-Sep-16	SE LANTAU	3	2.05	AUTUMN	STANDARD31516	S
22-Sep-16	SW LANTAU	2	0.31	AUTUMN	STANDARD31516	P
22-Sep-16	SW LANTAU	3	16.68	AUTUMN	STANDARD31516	P
22-Sep-16	SW LANTAU	4	2.40	AUTUMN	STANDARD31516	P
22-Sep-16	SW LANTAU	2	4.51	AUTUMN	STANDARD31516	S
22-Sep-16	SW LANTAU	3	7.90	AUTUMN	STANDARD31516	S
26-Sep-16	W LANTAU	1	2.12	AUTUMN	STANDARD36826	S
26-Sep-16	W LANTAU	2	8.34	AUTUMN	STANDARD36826	S
26-Sep-16	SW LANTAU	2	24.62	AUTUMN	STANDARD36826	P
26-Sep-16	SW LANTAU	3	5.50	AUTUMN	STANDARD36826	P
26-Sep-16	SW LANTAU	2	9.78	AUTUMN	STANDARD36826	S
27-Sep-16	NW LANTAU	2	8.68	AUTUMN	STANDARD36826	P
27-Sep-16	NW LANTAU	3	17.69	AUTUMN	STANDARD36826	P
27-Sep-16	NW LANTAU	2	2.43	AUTUMN	STANDARD36826	S
27-Sep-16	NW LANTAU	3	4.20	AUTUMN	STANDARD36826	S
27-Sep-16	DEEP BAY	2	2.05	AUTUMN	STANDARD36826	P
27-Sep-16	DEEP BAY	3	10.45	AUTUMN	STANDARD36826	P
27-Sep-16	DEEP BAY	2	1.90	AUTUMN	STANDARD36826	S
27-Sep-16	DEEP BAY	3	4.30	AUTUMN	STANDARD36826	S
27-Sep-16	NE LANTAU	2	11.24	AUTUMN	STANDARD36826	P
27-Sep-16	NE LANTAU	3	11.67	AUTUMN	STANDARD36826	P
27-Sep-16	NE LANTAU	2	7.99	AUTUMN	STANDARD36826	S
27-Sep-16	NE LANTAU	3	3.20	AUTUMN	STANDARD36826	S
30-Sep-16	PO TOI	1	7.32	AUTUMN	STANDARD36826	P
30-Sep-16	PO TOI	2	35.02	AUTUMN	STANDARD36826	P
30-Sep-16	PO TOI	3	8.67	AUTUMN	STANDARD36826	P
30-Sep-16	PO TOI	1	1.46	AUTUMN	STANDARD36826	S
30-Sep-16	PO TOI	2	0.50	AUTUMN	STANDARD36826	S
30-Sep-16	PO TOI	3	1.30	AUTUMN	STANDARD36826	S
30-Sep-16	NINEPINS	1	8.40	AUTUMN	STANDARD36826	P
30-Sep-16	NINEPINS	2	21.75	AUTUMN	STANDARD36826	P
30-Sep-16	NINEPINS	2	2.00	AUTUMN	STANDARD36826	S
6-Oct-16	SE LANTAU	1	1.27	AUTUMN	STANDARD31516	P
6-Oct-16	SE LANTAU	2	26.67	AUTUMN	STANDARD31516	P
6-Oct-16	SE LANTAU	2	9.27	AUTUMN	STANDARD31516	S
6-Oct-16	SW LANTAU	2	11.11	AUTUMN	STANDARD31516	P
6-Oct-16	SW LANTAU	3	2.74	AUTUMN	STANDARD31516	S
6-Oct-16	SW LANTAU	2	2.90	AUTUMN	STANDARD31516	P

Appendix I. (cont'd.)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	P/S
6-Oct-16	SW LANTAU	3	6.55	AUTUMN	STANDARD31516	S
14-Oct-16	W LANTAU	2	9.18	AUTUMN	STANDARD36826	S
14-Oct-16	NW LANTAU	2	20.31	AUTUMN	STANDARD36826	P
14-Oct-16	NW LANTAU	3	4.58	AUTUMN	STANDARD36826	P
14-Oct-16	NW LANTAU	2	9.01	AUTUMN	STANDARD36826	S
20-Oct-16	SW LANTAU	2	7.56	AUTUMN	STANDARD31516	P
20-Oct-16	SW LANTAU	3	5.43	AUTUMN	STANDARD31516	P
20-Oct-16	SW LANTAU	2	2.48	AUTUMN	STANDARD31516	S
20-Oct-16	SW LANTAU	3	2.03	AUTUMN	STANDARD31516	S
24-Oct-16	W LANTAU	2	7.84	AUTUMN	STANDARD36826	S
24-Oct-16	W LANTAU	3	1.71	AUTUMN	STANDARD36826	S
25-Oct-16	NW LANTAU	2	10.55	AUTUMN	STANDARD31516	P
25-Oct-16	NW LANTAU	3	15.41	AUTUMN	STANDARD31516	P
25-Oct-16	NW LANTAU	4	2.40	AUTUMN	STANDARD31516	P
25-Oct-16	NW LANTAU	2	1.90	AUTUMN	STANDARD31516	S
25-Oct-16	NW LANTAU	3	3.24	AUTUMN	STANDARD31516	S
25-Oct-16	NW LANTAU	4	0.20	AUTUMN	STANDARD31516	S
25-Oct-16	W LANTAU	1	2.26	AUTUMN	STANDARD31516	P
25-Oct-16	W LANTAU	2	4.76	AUTUMN	STANDARD31516	P
25-Oct-16	W LANTAU	3	7.31	AUTUMN	STANDARD31516	P
25-Oct-16	W LANTAU	4	5.12	AUTUMN	STANDARD31516	P
25-Oct-16	W LANTAU	5	1.21	AUTUMN	STANDARD31516	P
25-Oct-16	W LANTAU	2	2.18	AUTUMN	STANDARD31516	S
25-Oct-16	W LANTAU	3	11.24	AUTUMN	STANDARD31516	S
25-Oct-16	W LANTAU	4	5.28	AUTUMN	STANDARD31516	S
25-Oct-16	W LANTAU	5	1.02	AUTUMN	STANDARD31516	S
26-Oct-16	W LANTAU	2	7.91	AUTUMN	STANDARD36826	S
26-Oct-16	W LANTAU	3	1.88	AUTUMN	STANDARD36826	S
26-Oct-16	SW LANTAU	2	5.72	AUTUMN	STANDARD36826	P
26-Oct-16	SW LANTAU	3	13.65	AUTUMN	STANDARD36826	P
26-Oct-16	SW LANTAU	2	4.50	AUTUMN	STANDARD36826	S
26-Oct-16	SW LANTAU	3	4.93	AUTUMN	STANDARD36826	S
26-Oct-16	SE LANTAU	2	3.20	AUTUMN	STANDARD36826	P
26-Oct-16	SE LANTAU	3	17.29	AUTUMN	STANDARD36826	P
26-Oct-16	SE LANTAU	4	2.48	AUTUMN	STANDARD36826	P
26-Oct-16	SE LANTAU	2	4.90	AUTUMN	STANDARD36826	S
26-Oct-16	SE LANTAU	3	0.83	AUTUMN	STANDARD36826	S
26-Oct-16	SE LANTAU	4	4.50	AUTUMN	STANDARD36826	S
27-Oct-16	PO TOI	2	64.71	AUTUMN	STANDARD31516	P
27-Oct-16	PO TOI	3	4.49	AUTUMN	STANDARD31516	P
27-Oct-16	PO TOI	2	13.20	AUTUMN	STANDARD31516	S
27-Oct-16	PO TOI	3	2.60	AUTUMN	STANDARD31516	S
31-Oct-16	NW LANTAU	2	22.96	AUTUMN	STANDARD36826	P
31-Oct-16	NW LANTAU	3	17.25	AUTUMN	STANDARD36826	P
31-Oct-16	NW LANTAU	2	8.42	AUTUMN	STANDARD36826	S
31-Oct-16	NW LANTAU	3	2.00	AUTUMN	STANDARD36826	S
31-Oct-16	DEEP BAY	2	12.93	AUTUMN	STANDARD36826	P
31-Oct-16	DEEP BAY	2	7.37	AUTUMN	STANDARD36826	S
31-Oct-16	NE LANTAU	1	0.39	AUTUMN	STANDARD36826	P
31-Oct-16	NE LANTAU	2	9.43	AUTUMN	STANDARD36826	P
31-Oct-16	NE LANTAU	2	10.18	AUTUMN	STANDARD36826	S
4-Nov-16	SW LANTAU	2	15.73	AUTUMN	STANDARD36826	P
4-Nov-16	SW LANTAU	3	7.23	AUTUMN	STANDARD36826	P
4-Nov-16	SW LANTAU	2	6.80	AUTUMN	STANDARD36826	S
4-Nov-16	SW LANTAU	3	2.24	AUTUMN	STANDARD36826	S
9-Nov-16	W LANTAU	2	1.90	AUTUMN	STANDARD36826	P
9-Nov-16	W LANTAU	3	7.62	AUTUMN	STANDARD36826	P
9-Nov-16	W LANTAU	2	5.06	AUTUMN	STANDARD36826	S
9-Nov-16	W LANTAU	3	2.29	AUTUMN	STANDARD36826	S
9-Nov-16	SW LANTAU	2	21.88	AUTUMN	STANDARD36826	P
9-Nov-16	SW LANTAU	3	8.76	AUTUMN	STANDARD36826	P

Appendix I. (cont'd.)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	P/S
9-Nov-16	SW LANTAU	2	14.56	AUTUMN	STANDARD36826	S
10-Nov-16	NW LANTAU	2	8.31	AUTUMN	STANDARD36826	P
10-Nov-16	NW LANTAU	3	14.07	AUTUMN	STANDARD36826	P
10-Nov-16	NW LANTAU	2	3.65	AUTUMN	STANDARD36826	S
10-Nov-16	NW LANTAU	3	2.27	AUTUMN	STANDARD36826	S
10-Nov-16	DEEP BAY	2	7.39	AUTUMN	STANDARD36826	P
10-Nov-16	DEEP BAY	3	4.43	AUTUMN	STANDARD36826	P
10-Nov-16	DEEP BAY	2	6.89	AUTUMN	STANDARD36826	S
10-Nov-16	DEEP BAY	3	3.49	AUTUMN	STANDARD36826	S
10-Nov-16	NE LANTAU	2	24.30	AUTUMN	STANDARD36826	P
10-Nov-16	NE LANTAU	2	13.60	AUTUMN	STANDARD36826	S
11-Nov-16	SW LANTAU	2	7.92	AUTUMN	STANDARD36826	S
11-Nov-16	SW LANTAU	3	1.42	AUTUMN	STANDARD36826	S
15-Nov-16	PO TOI	1	3.00	AUTUMN	STANDARD36826	P
15-Nov-16	PO TOI	2	44.39	AUTUMN	STANDARD36826	P
15-Nov-16	PO TOI	3	5.80	AUTUMN	STANDARD36826	P
15-Nov-16	PO TOI	2	7.31	AUTUMN	STANDARD36826	S
15-Nov-16	NINEPINS	3	19.50	AUTUMN	STANDARD36826	P
21-Nov-16	SE LANTAU	2	6.83	AUTUMN	STANDARD36826	P
21-Nov-16	SE LANTAU	3	22.53	AUTUMN	STANDARD36826	P
21-Nov-16	SE LANTAU	4	6.01	AUTUMN	STANDARD36826	P
21-Nov-16	SE LANTAU	2	1.20	AUTUMN	STANDARD36826	S
21-Nov-16	SE LANTAU	3	6.47	AUTUMN	STANDARD36826	S
21-Nov-16	SE LANTAU	4	4.96	AUTUMN	STANDARD36826	S
21-Nov-16	SW LANTAU	2	4.96	AUTUMN	STANDARD36826	P
21-Nov-16	SW LANTAU	3	6.99	AUTUMN	STANDARD36826	P
21-Nov-16	SW LANTAU	4	8.23	AUTUMN	STANDARD36826	P
21-Nov-16	SW LANTAU	2	1.00	AUTUMN	STANDARD36826	S
21-Nov-16	SW LANTAU	3	1.29	AUTUMN	STANDARD36826	S
21-Nov-16	SW LANTAU	4	3.13	AUTUMN	STANDARD36826	S
25-Nov-16	W LANTAU	2	0.36	AUTUMN	STANDARD36826	P
25-Nov-16	W LANTAU	3	7.69	AUTUMN	STANDARD36826	P
25-Nov-16	W LANTAU	4	2.01	AUTUMN	STANDARD36826	P
25-Nov-16	W LANTAU	2	1.63	AUTUMN	STANDARD36826	S
25-Nov-16	W LANTAU	3	7.71	AUTUMN	STANDARD36826	S
25-Nov-16	SW LANTAU	2	4.22	AUTUMN	STANDARD36826	S
25-Nov-16	SW LANTAU	3	2.69	AUTUMN	STANDARD36826	S
25-Nov-16	SE LANTAU	2	28.75	AUTUMN	STANDARD36826	P
25-Nov-16	SE LANTAU	3	1.30	AUTUMN	STANDARD36826	P
25-Nov-16	SE LANTAU	2	10.31	AUTUMN	STANDARD36826	S
28-Nov-16	NE LANTAU	2	4.08	AUTUMN	STANDARD31516	P
28-Nov-16	NE LANTAU	3	12.74	AUTUMN	STANDARD31516	P
28-Nov-16	NE LANTAU	2	5.17	AUTUMN	STANDARD31516	S
28-Nov-16	NE LANTAU	3	4.71	AUTUMN	STANDARD31516	S
28-Nov-16	NW LANTAU	2	3.89	AUTUMN	STANDARD31516	P
28-Nov-16	NW LANTAU	3	23.19	AUTUMN	STANDARD31516	P
28-Nov-16	NW LANTAU	4	2.40	AUTUMN	STANDARD31516	P
28-Nov-16	NW LANTAU	3	9.85	AUTUMN	STANDARD31516	S
28-Nov-16	NW LANTAU	4	0.60	AUTUMN	STANDARD31516	S
28-Nov-16	DEEP BAY	2	7.09	AUTUMN	STANDARD31516	P
28-Nov-16	DEEP BAY	3	5.27	AUTUMN	STANDARD31516	P
28-Nov-16	DEEP BAY	2	4.44	AUTUMN	STANDARD31516	S
28-Nov-16	DEEP BAY	3	3.50	AUTUMN	STANDARD31516	S
29-Nov-16	SE LANTAU	2	30.41	AUTUMN	STANDARD36826	P
29-Nov-16	SE LANTAU	3	25.72	AUTUMN	STANDARD36826	P
29-Nov-16	SE LANTAU	4	1.97	AUTUMN	STANDARD36826	P
29-Nov-16	SE LANTAU	2	15.46	AUTUMN	STANDARD36826	S
29-Nov-16	SE LANTAU	3	2.69	AUTUMN	STANDARD36826	S
29-Nov-16	SE LANTAU	4	1.02	AUTUMN	STANDARD36826	S
2-Dec-16	SW LANTAU	2	11.38	WINTER	STANDARD36826	P
2-Dec-16	SW LANTAU	3	3.48	WINTER	STANDARD36826	P

Appendix I. (cont'd.)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	P/S
2-Dec-16	SW LANTAU	2	4.61	WINTER	STANDARD36826	S
2-Dec-16	SW LANTAU	3	2.20	WINTER	STANDARD36826	S
5-Dec-16	LAMMA	1	5.37	WINTER	STANDARD36826	P
5-Dec-16	LAMMA	2	32.61	WINTER	STANDARD36826	P
5-Dec-16	LAMMA	3	36.10	WINTER	STANDARD36826	P
5-Dec-16	LAMMA	1	1.68	WINTER	STANDARD36826	S
5-Dec-16	LAMMA	2	12.24	WINTER	STANDARD36826	S
5-Dec-16	LAMMA	3	4.20	WINTER	STANDARD36826	S
7-Dec-16	W LANTAU	3	7.20	WINTER	STANDARD36826	P
7-Dec-16	W LANTAU	4	1.69	WINTER	STANDARD36826	P
7-Dec-16	W LANTAU	2	1.57	WINTER	STANDARD36826	S
7-Dec-16	W LANTAU	3	9.41	WINTER	STANDARD36826	S
7-Dec-16	SW LANTAU	2	24.77	WINTER	STANDARD36826	P
7-Dec-16	SW LANTAU	3	2.54	WINTER	STANDARD36826	P
7-Dec-16	SW LANTAU	2	8.03	WINTER	STANDARD36826	S
8-Dec-16	LAMMA	1	0.60	WINTER	STANDARD31516	P
8-Dec-16	LAMMA	2	17.21	WINTER	STANDARD31516	P
8-Dec-16	LAMMA	3	19.34	WINTER	STANDARD31516	P
8-Dec-16	LAMMA	1	0.30	WINTER	STANDARD31516	S
8-Dec-16	LAMMA	2	5.12	WINTER	STANDARD31516	S
8-Dec-16	LAMMA	3	4.63	WINTER	STANDARD31516	S
8-Dec-16	SE LANTAU	2	18.84	WINTER	STANDARD31516	P
8-Dec-16	SE LANTAU	3	1.66	WINTER	STANDARD31516	P
8-Dec-16	SE LANTAU	2	6.26	WINTER	STANDARD31516	S
8-Dec-16	SE LANTAU	3	0.40	WINTER	STANDARD31516	S
12-Dec-16	SW LANTAU	3	8.58	WINTER	STANDARD36826	S
12-Dec-16	SW LANTAU	4	1.04	WINTER	STANDARD36826	S
12-Dec-16	SE LANTAU	3	13.16	WINTER	STANDARD36826	P
12-Dec-16	SE LANTAU	4	10.24	WINTER	STANDARD36826	P
12-Dec-16	SE LANTAU	2	1.80	WINTER	STANDARD36826	S
12-Dec-16	SE LANTAU	3	3.60	WINTER	STANDARD36826	S
12-Dec-16	SE LANTAU	4	3.80	WINTER	STANDARD36826	S
13-Dec-16	W LANTAU	2	11.30	WINTER	STANDARD36826	S
13-Dec-16	SW LANTAU	2	24.94	WINTER	STANDARD36826	P
13-Dec-16	SW LANTAU	3	1.35	WINTER	STANDARD36826	P
13-Dec-16	SW LANTAU	2	11.01	WINTER	STANDARD36826	S
13-Dec-16	SW LANTAU	3	3.54	WINTER	STANDARD36826	S
13-Dec-16	SE LANTAU	2	12.50	WINTER	STANDARD36826	P
13-Dec-16	SE LANTAU	2	2.76	WINTER	STANDARD36826	S
23-Dec-16	NW LANTAU	2	2.60	WINTER	STANDARD36826	P
23-Dec-16	NW LANTAU	3	29.25	WINTER	STANDARD36826	P
23-Dec-16	NW LANTAU	3	4.85	WINTER	STANDARD36826	S
23-Dec-16	DEEP BAY	2	11.70	WINTER	STANDARD36826	P
23-Dec-16	DEEP BAY	3	2.02	WINTER	STANDARD36826	P
23-Dec-16	DEEP BAY	2	7.08	WINTER	STANDARD36826	S
23-Dec-16	NE LANTAU	2	18.45	WINTER	STANDARD36826	P
23-Dec-16	NE LANTAU	2	9.65	WINTER	STANDARD36826	S
3-Jan-17	W LANTAU	2	7.36	WINTER	STANDARD31516	S
3-Jan-17	W LANTAU	3	3.34	WINTER	STANDARD31516	S
3-Jan-17	NW LANTAU	2	6.15	WINTER	STANDARD31516	S
3-Jan-17	NW LANTAU	3	1.81	WINTER	STANDARD31516	S
4-Jan-17	W LANTAU	2	8.95	WINTER	STANDARD36826	P
4-Jan-17	W LANTAU	3	6.42	WINTER	STANDARD36826	P
4-Jan-17	W LANTAU	4	2.11	WINTER	STANDARD36826	P
4-Jan-17	W LANTAU	2	9.26	WINTER	STANDARD36826	S
4-Jan-17	W LANTAU	3	6.23	WINTER	STANDARD36826	S
4-Jan-17	W LANTAU	4	0.91	WINTER	STANDARD36826	S
4-Jan-17	NW LANTAU	2	18.31	WINTER	STANDARD36826	P
4-Jan-17	NW LANTAU	3	4.83	WINTER	STANDARD36826	P
4-Jan-17	NW LANTAU	2	6.08	WINTER	STANDARD36826	S
5-Jan-17	SE LANTAU	2	22.94	WINTER	STANDARD36826	P

Appendix I. (cont'd.)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	P/S
5-Jan-17	SE LANTAU	3	4.80	WINTER	STANDARD36826	P
5-Jan-17	SE LANTAU	2	9.16	WINTER	STANDARD36826	S
5-Jan-17	SW LANTAU	2	12.94	WINTER	STANDARD36826	P
5-Jan-17	SW LANTAU	3	8.40	WINTER	STANDARD36826	P
5-Jan-17	SW LANTAU	2	9.96	WINTER	STANDARD36826	S
5-Jan-17	SW LANTAU	3	1.80	WINTER	STANDARD36826	S
9-Jan-17	SW LANTAU	2	2.66	WINTER	STANDARD36826	P
9-Jan-17	SW LANTAU	3	8.58	WINTER	STANDARD36826	P
9-Jan-17	SW LANTAU	3	7.56	WINTER	STANDARD36826	S
13-Jan-17	NW LANTAU	2	17.72	WINTER	STANDARD36826	P
13-Jan-17	NW LANTAU	3	13.10	WINTER	STANDARD36826	P
13-Jan-17	NW LANTAU	2	3.91	WINTER	STANDARD36826	S
13-Jan-17	NW LANTAU	3	0.97	WINTER	STANDARD36826	S
13-Jan-17	DEEP BAY	2	11.15	WINTER	STANDARD36826	P
13-Jan-17	DEEP BAY	3	0.50	WINTER	STANDARD36826	P
13-Jan-17	DEEP BAY	2	7.35	WINTER	STANDARD36826	S
13-Jan-17	NE LANTAU	1	6.20	WINTER	STANDARD36826	P
13-Jan-17	NE LANTAU	2	18.10	WINTER	STANDARD36826	P
13-Jan-17	NE LANTAU	1	2.30	WINTER	STANDARD36826	S
13-Jan-17	NE LANTAU	2	8.20	WINTER	STANDARD36826	S
17-Jan-17	W LANTAU	2	3.72	WINTER	STANDARD36826	P
17-Jan-17	W LANTAU	3	4.73	WINTER	STANDARD36826	P
17-Jan-17	W LANTAU	2	4.55	WINTER	STANDARD36826	S
17-Jan-17	W LANTAU	3	3.72	WINTER	STANDARD36826	S
17-Jan-17	SW LANTAU	2	7.86	WINTER	STANDARD36826	P
17-Jan-17	SW LANTAU	3	10.35	WINTER	STANDARD36826	P
17-Jan-17	SW LANTAU	2	3.04	WINTER	STANDARD36826	S
17-Jan-17	SW LANTAU	3	8.64	WINTER	STANDARD36826	S
19-Jan-17	LAMMA	2	20.12	WINTER	STANDARD31516	P
19-Jan-17	LAMMA	3	15.14	WINTER	STANDARD31516	P
19-Jan-17	LAMMA	2	4.94	WINTER	STANDARD31516	S
19-Jan-17	LAMMA	3	3.50	WINTER	STANDARD31516	S
19-Jan-17	SE LANTAU	2	19.67	WINTER	STANDARD31516	P
19-Jan-17	SE LANTAU	2	6.98	WINTER	STANDARD31516	S
23-Jan-17	NW LANTAU	2	18.43	WINTER	STANDARD36826	P
23-Jan-17	NW LANTAU	3	12.82	WINTER	STANDARD36826	P
23-Jan-17	NW LANTAU	2	7.65	WINTER	STANDARD36826	S
23-Jan-17	DEEP BAY	2	8.59	WINTER	STANDARD36826	P
23-Jan-17	DEEP BAY	3	4.43	WINTER	STANDARD36826	P
23-Jan-17	DEEP BAY	2	2.74	WINTER	STANDARD36826	S
23-Jan-17	DEEP BAY	3	4.74	WINTER	STANDARD36826	S
23-Jan-17	NE LANTAU	2	19.33	WINTER	STANDARD36826	P
23-Jan-17	NE LANTAU	2	10.17	WINTER	STANDARD36826	S
26-Jan-17	LAMMA	2	14.00	WINTER	STANDARD36826	P
26-Jan-17	LAMMA	3	12.01	WINTER	STANDARD36826	P
26-Jan-17	LAMMA	4	9.90	WINTER	STANDARD36826	P
26-Jan-17	LAMMA	2	5.19	WINTER	STANDARD36826	S
26-Jan-17	LAMMA	3	5.40	WINTER	STANDARD36826	S
26-Jan-17	SE LANTAU	3	19.45	WINTER	STANDARD36826	P
26-Jan-17	SE LANTAU	4	6.08	WINTER	STANDARD36826	P
26-Jan-17	SE LANTAU	2	0.81	WINTER	STANDARD36826	S
26-Jan-17	SE LANTAU	3	6.80	WINTER	STANDARD36826	S
26-Jan-17	SE LANTAU	4	0.90	WINTER	STANDARD36826	S
1-Feb-17	W LANTAU	2	2.44	WINTER	STANDARD36826	P
1-Feb-17	W LANTAU	3	3.80	WINTER	STANDARD36826	P
1-Feb-17	W LANTAU	4	4.07	WINTER	STANDARD36826	P
1-Feb-17	W LANTAU	2	3.27	WINTER	STANDARD36826	S
1-Feb-17	W LANTAU	3	8.79	WINTER	STANDARD36826	S
1-Feb-17	SW LANTAU	2	25.25	WINTER	STANDARD36826	P
1-Feb-17	SW LANTAU	3	0.66	WINTER	STANDARD36826	P
1-Feb-17	SW LANTAU	2	10.14	WINTER	STANDARD36826	S

Appendix I. (cont'd.)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	P/S
1-Feb-17	SW LANTAU	3	0.83	WINTER	STANDARD36826	S
3-Feb-17	NW LANTAU	1	3.00	WINTER	STANDARD36826	P
3-Feb-17	NW LANTAU	2	22.62	WINTER	STANDARD36826	P
3-Feb-17	NW LANTAU	3	4.68	WINTER	STANDARD36826	P
3-Feb-17	NW LANTAU	1	0.90	WINTER	STANDARD36826	S
3-Feb-17	NW LANTAU	2	4.60	WINTER	STANDARD36826	S
3-Feb-17	DEEP BAY	2	12.77	WINTER	STANDARD36826	P
3-Feb-17	DEEP BAY	2	7.63	WINTER	STANDARD36826	S
3-Feb-17	NE LANTAU	1	15.62	WINTER	STANDARD36826	P
3-Feb-17	NE LANTAU	2	9.62	WINTER	STANDARD36826	P
3-Feb-17	NE LANTAU	1	4.10	WINTER	STANDARD36826	S
3-Feb-17	NE LANTAU	2	6.66	WINTER	STANDARD36826	S
6-Feb-17	W LANTAU	2	7.77	WINTER	STANDARD36826	S
6-Feb-17	W LANTAU	3	2.64	WINTER	STANDARD36826	S
6-Feb-17	W LANTAU	4	0.41	WINTER	STANDARD36826	S
6-Feb-17	NE LANTAU	3	9.84	WINTER	STANDARD36826	P
6-Feb-17	NE LANTAU	4	1.95	WINTER	STANDARD36826	P
6-Feb-17	NE LANTAU	3	2.71	WINTER	STANDARD36826	S
6-Feb-17	NE LANTAU	4	1.70	WINTER	STANDARD36826	S
13-Feb-17	SW LANTAU	3	7.09	WINTER	STANDARD36826	P
13-Feb-17	SW LANTAU	4	5.74	WINTER	STANDARD36826	P
13-Feb-17	SW LANTAU	5	0.40	WINTER	STANDARD36826	P
13-Feb-17	SW LANTAU	3	5.60	WINTER	STANDARD36826	S
13-Feb-17	SW LANTAU	4	4.17	WINTER	STANDARD36826	S
13-Feb-17	SW LANTAU	5	1.00	WINTER	STANDARD36826	S
17-Feb-17	W LANTAU	2	9.37	WINTER	STANDARD36826	S
17-Feb-17	W LANTAU	3	2.49	WINTER	STANDARD36826	S
17-Feb-17	SW LANTAU	1	2.78	WINTER	STANDARD36826	P
17-Feb-17	SW LANTAU	2	8.55	WINTER	STANDARD36826	P
17-Feb-17	SW LANTAU	3	1.35	WINTER	STANDARD36826	P
17-Feb-17	SW LANTAU	1	3.74	WINTER	STANDARD36826	S
17-Feb-17	SW LANTAU	2	9.65	WINTER	STANDARD36826	S
17-Feb-17	SE LANTAU	0	1.00	WINTER	STANDARD36826	P
17-Feb-17	SE LANTAU	1	9.86	WINTER	STANDARD36826	P
17-Feb-17	SE LANTAU	2	5.95	WINTER	STANDARD36826	P
17-Feb-17	SE LANTAU	0	2.06	WINTER	STANDARD36826	S
23-Feb-17	LAMMA	2	2.95	WINTER	STANDARD31516	P
23-Feb-17	LAMMA	3	12.81	WINTER	STANDARD31516	P
23-Feb-17	LAMMA	4	12.58	WINTER	STANDARD31516	P
23-Feb-17	LAMMA	5	0.80	WINTER	STANDARD31516	P
23-Feb-17	LAMMA	2	0.19	WINTER	STANDARD31516	S
23-Feb-17	LAMMA	3	6.97	WINTER	STANDARD31516	S
23-Feb-17	SE LANTAU	2	8.99	WINTER	STANDARD31516	P
23-Feb-17	SE LANTAU	3	15.24	WINTER	STANDARD31516	P
23-Feb-17	SE LANTAU	4	6.62	WINTER	STANDARD31516	P
23-Feb-17	SE LANTAU	5	1.40	WINTER	STANDARD31516	P
23-Feb-17	SE LANTAU	6	2.80	WINTER	STANDARD31516	P
23-Feb-17	SE LANTAU	2	4.84	WINTER	STANDARD31516	S
23-Feb-17	SE LANTAU	3	6.15	WINTER	STANDARD31516	S
23-Feb-17	SE LANTAU	4	2.26	WINTER	STANDARD31516	S
23-Feb-17	SE LANTAU	5	0.50	WINTER	STANDARD31516	S
27-Feb-17	NW LANTAU	2	1.53	WINTER	STANDARD36826	P
27-Feb-17	NW LANTAU	3	30.42	WINTER	STANDARD36826	P
27-Feb-17	NW LANTAU	4	4.79	WINTER	STANDARD36826	P
27-Feb-17	NW LANTAU	2	1.64	WINTER	STANDARD36826	S
27-Feb-17	NW LANTAU	3	6.44	WINTER	STANDARD36826	S
27-Feb-17	NW LANTAU	4	2.40	WINTER	STANDARD36826	S
27-Feb-17	DEEP BAY	2	2.40	WINTER	STANDARD36826	P
27-Feb-17	DEEP BAY	3	11.74	WINTER	STANDARD36826	P
27-Feb-17	DEEP BAY	2	2.80	WINTER	STANDARD36826	S
27-Feb-17	DEEP BAY	3	4.06	WINTER	STANDARD36826	S

Appendix I. (cont'd.)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	P/S
27-Feb-17	NE LANTAU	2	2.20	WINTER	STANDARD36826	P
27-Feb-17	NE LANTAU	3	13.63	WINTER	STANDARD36826	P
27-Feb-17	NE LANTAU	2	3.30	WINTER	STANDARD36826	S
27-Feb-17	NE LANTAU	3	5.77	WINTER	STANDARD36826	S
1-Mar-17	LAMMA	1	1.00	SPRING	STANDARD31516	P
1-Mar-17	LAMMA	2	34.88	SPRING	STANDARD31516	P
1-Mar-17	LAMMA	3	3.82	SPRING	STANDARD31516	P
1-Mar-17	LAMMA	2	6.06	SPRING	STANDARD31516	S
1-Mar-17	LAMMA	3	3.54	SPRING	STANDARD31516	S
1-Mar-17	SE LANTAU	1	2.85	SPRING	STANDARD31516	P
1-Mar-17	SE LANTAU	2	17.57	SPRING	STANDARD31516	P
1-Mar-17	SE LANTAU	2	6.20	SPRING	STANDARD31516	S
1-Mar-17	SW LANTAU	2	8.68	SPRING	STANDARD36826	P
1-Mar-17	SW LANTAU	3	11.77	SPRING	STANDARD36826	P
1-Mar-17	SW LANTAU	4	3.08	SPRING	STANDARD36826	P
1-Mar-17	SW LANTAU	2	4.80	SPRING	STANDARD36826	S
1-Mar-17	SW LANTAU	3	7.15	SPRING	STANDARD36826	S
1-Mar-17	SW LANTAU	4	2.41	SPRING	STANDARD36826	S
6-Mar-17	W LANTAU	1	3.76	SPRING	STANDARD36826	S
6-Mar-17	W LANTAU	2	7.47	SPRING	STANDARD36826	S
10-Mar-17	LAMMA	2	0.38	SPRING	STANDARD36826	P
10-Mar-17	LAMMA	3	11.25	SPRING	STANDARD36826	P
10-Mar-17	LAMMA	4	3.85	SPRING	STANDARD36826	P
10-Mar-17	LAMMA	2	0.43	SPRING	STANDARD36826	S
10-Mar-17	LAMMA	3	6.23	SPRING	STANDARD36826	S
10-Mar-17	SE LANTAU	1	4.48	SPRING	STANDARD36826	P
10-Mar-17	SE LANTAU	2	29.71	SPRING	STANDARD36826	P
10-Mar-17	SE LANTAU	3	7.90	SPRING	STANDARD36826	P
10-Mar-17	SE LANTAU	1	3.70	SPRING	STANDARD36826	S
10-Mar-17	SE LANTAU	2	8.74	SPRING	STANDARD36826	S
10-Mar-17	SE LANTAU	3	5.28	SPRING	STANDARD36826	S
13-Mar-17	LAMMA	1	1.30	SPRING	STANDARD31516	P
13-Mar-17	LAMMA	2	63.46	SPRING	STANDARD31516	P
13-Mar-17	LAMMA	3	14.40	SPRING	STANDARD31516	P
13-Mar-17	LAMMA	1	2.64	SPRING	STANDARD31516	S
13-Mar-17	LAMMA	2	20.10	SPRING	STANDARD31516	S
13-Mar-17	LAMMA	3	0.30	SPRING	STANDARD31516	S
13-Mar-17	SW LANTAU	1	1.58	SPRING	STANDARD36826	P
13-Mar-17	SW LANTAU	2	14.53	SPRING	STANDARD36826	P
13-Mar-17	SW LANTAU	3	6.81	SPRING	STANDARD36826	P
13-Mar-17	SW LANTAU	2	5.50	SPRING	STANDARD36826	S
13-Mar-17	SW LANTAU	3	2.36	SPRING	STANDARD36826	S
21-Mar-17	W LANTAU	1	6.33	SPRING	STANDARD36826	S
21-Mar-17	W LANTAU	2	4.37	SPRING	STANDARD36826	S
21-Mar-17	SW LANTAU	2	19.48	SPRING	STANDARD36826	P
21-Mar-17	SW LANTAU	3	1.30	SPRING	STANDARD36826	P
21-Mar-17	SW LANTAU	1	2.75	SPRING	STANDARD36826	S
21-Mar-17	SW LANTAU	2	6.89	SPRING	STANDARD36826	S
21-Mar-17	SW LANTAU	3	2.40	SPRING	STANDARD36826	S
21-Mar-17	SE LANTAU	1	9.52	SPRING	STANDARD36826	P
21-Mar-17	SE LANTAU	2	20.03	SPRING	STANDARD36826	P
21-Mar-17	SE LANTAU	1	4.18	SPRING	STANDARD36826	S
21-Mar-17	SE LANTAU	2	2.20	SPRING	STANDARD36826	S
24-Mar-17	NW LANTAU	2	0.71	SPRING	STANDARD36826	P
24-Mar-17	NW LANTAU	3	8.16	SPRING	STANDARD36826	P
24-Mar-17	NW LANTAU	4	16.50	SPRING	STANDARD36826	P
24-Mar-17	NW LANTAU	5	8.01	SPRING	STANDARD36826	P
24-Mar-17	NW LANTAU	6	1.40	SPRING	STANDARD36826	P
24-Mar-17	NW LANTAU	3	5.21	SPRING	STANDARD36826	S
24-Mar-17	NW LANTAU	4	5.32	SPRING	STANDARD36826	S
24-Mar-17	DEEP BAY	2	1.71	SPRING	STANDARD36826	P

Appendix I. (cont'd.)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	P/S
24-Mar-17	DEEP BAY	3	9.28	SPRING	STANDARD36826	P
24-Mar-17	DEEP BAY	4	1.66	SPRING	STANDARD36826	P
24-Mar-17	DEEP BAY	2	1.44	SPRING	STANDARD36826	S
24-Mar-17	DEEP BAY	3	5.81	SPRING	STANDARD36826	S
24-Mar-17	NE LANTAU	2	7.08	SPRING	STANDARD36826	P
24-Mar-17	NE LANTAU	3	8.85	SPRING	STANDARD36826	P
24-Mar-17	NE LANTAU	2	6.67	SPRING	STANDARD36826	S
24-Mar-17	NE LANTAU	3	3.60	SPRING	STANDARD36826	S

Appendix II. HKCRP-AFCD Chinese White Dolphin Sighting Database (April 2016 - March 2017)

(Note: P = sightings made on primary lines; S = sightings made on secondary line

DATE	STG #	TIME	HRD SZ	AREA	BEAU	PSD	EFFORT	TYPE	NORTHING	EASTING	SEASON	BOAT ASSOC.	P/S
6-Apr-16	1	1025	12	W LANTAU	2	58	ON	HKCRP	813713	802792	SPRING	NONE	S
6-Apr-16	2	1113	3	W LANTAU	4	27	ON	HKCRP	806173	802043	SPRING	NONE	S
6-Apr-16	3	1345	2	SW LANTAU	2	ND	OFF	HKCRP	805606	803300	SPRING	NONE	
14-Apr-16	1	1613	4	W LANTAU	2	74	ON	HKCRP	808800	800864	SPRING	NONE	S
20-Apr-16	1	1339	4	W LANTAU	3	ND	OFF	HKCRP	805930	801929	SPRING	NONE	
20-Apr-16	2	1359	6	SW LANTAU	3	ND	OFF	HKCRP	805762	802507	SPRING	NONE	
22-Apr-16	1	1015	1	W LANTAU	2	132	ON	HKCRP	814552	804010	SPRING	NONE	S
22-Apr-16	2	1041	2	W LANTAU	1	63	ON	HKCRP	808878	800812	SPRING	NONE	S
22-Apr-16	3	1050	1	W LANTAU	2	196	ON	HKCRP	806794	801653	SPRING	NONE	S
26-Apr-16	1	1134	1	W LANTAU	3	294	ON	HKCRP	809424	799463	SPRING	NONE	P
26-Apr-16	2	1155	7	W LANTAU	3	339	ON	HKCRP	808560	799430	SPRING	NONE	S
26-Apr-16	3	1249	3	W LANTAU	3	398	ON	HKCRP	807429	800262	SPRING	NONE	P
26-Apr-16	4	1321	2	W LANTAU	2	440	ON	HKCRP	806573	801694	SPRING	NONE	S
26-Apr-16	5	1344	1	W LANTAU	3	296	ON	HKCRP	806539	801756	SPRING	NONE	P
26-Apr-16	6	1411	1	W LANTAU	3	176	ON	HKCRP	810398	799723	SPRING	NONE	S
4-May-16	1	1103	1	W LANTAU	2	535	ON	HKCRP	811469	801066	SPRING	NONE	P
4-May-16	2	1127	5	W LANTAU	2	11	ON	HKCRP	809411	800215	SPRING	NONE	P
4-May-16	3	1200	6	W LANTAU	2	33	ON	HKCRP	807438	800881	SPRING	NONE	P
4-May-16	4	1239	4	SW LANTAU	2	ND	OFF	HKCRP	805962	802394	SPRING	NONE	
4-May-16	5	1255	1	SW LANTAU	2	171	ON	HKCRP	806081	803477	SPRING	NONE	P
4-May-16	6	1516	13	W LANTAU	2	76	ON	HKCRP	808357	800924	SPRING	NONE	S
6-May-16	1	1017	2	W LANTAU	2	59	ON	HKCRP	813767	803071	SPRING	NONE	S
6-May-16	2	1023	2	W LANTAU	3	99	ON	HKCRP	812507	802130	SPRING	NONE	S
6-May-16	3	1027	5	W LANTAU	3	109	ON	HKCRP	811567	801674	SPRING	NONE	S
6-May-16	4	1032	2	W LANTAU	3	180	ON	HKCRP	810395	801001	SPRING	NONE	S
6-May-16	5	1039	2	W LANTAU	3	115	ON	HKCRP	808690	800874	SPRING	NONE	S
18-May-16	1	1036	8	W LANTAU	2	426	ON	HKCRP	812453	801490	SPRING	NONE	P
18-May-16	2	1112	5	W LANTAU	2	58	ON	HKCRP	811588	802334	SPRING	NONE	S
18-May-16	3	1132	1	W LANTAU	2	256	ON	HKCRP	810450	800919	SPRING	NONE	P
18-May-16	4	1207	7	W LANTAU	3	111	ON	HKCRP	806429	801735	SPRING	NONE	S
18-May-16	5	1251	2	SW LANTAU	3	ND	OFF	HKCRP	806866	804489	SPRING	NONE	
18-May-16	6	1452	1	SE LANTAU	2	10	ON	HKCRP	809571	815506	SPRING	NONE	P
25-May-16	1	1502	2	SW LANTAU	4	ND	OFF	HKCRP	807453	810203	SPRING	NONE	

Appendix II. (cont'd.)

DATE	STG #	TIME	HRD SZ	AREA	BEAU	PSD	EFFORT	TYPE	NORTHING	EASTING	SEASON	BOAT ASSOC.	P/S
25-May-16	2	1535	1	SE LANTAU	2	ND	OFF	HKCRP	807632	816174	SPRING	NONE	
3-Jun-16	1	1108	4	W LANTAU	4	141	ON	HKCRP	806317	801920	SUMMER	NONE	S
3-Jun-16	2	1123	3	SW LANTAU	2	ND	OFF	HKCRP	806195	802332	SUMMER	NONE	
3-Jun-16	3	1403	1	SW LANTAU	3	54	ON	HKCRP	805684	808436	SUMMER	NONE	S
7-Jun-16	1	1023	1	W LANTAU	2	82	ON	HKCRP	813569	802812	SUMMER	NONE	S
7-Jun-16	2	1028	1	W LANTAU	2	46	ON	HKCRP	812739	802336	SUMMER	NONE	S
7-Jun-16	3	1035	2	W LANTAU	2	272	ON	HKCRP	811168	801611	SUMMER	NONE	S
7-Jun-16	4	1042	5	W LANTAU	2	214	ON	HKCRP	809642	801010	SUMMER	NONE	S
7-Jun-16	5	1104	9	W LANTAU	2	17	ON	HKCRP	806561	801807	SUMMER	NONE	S
8-Jun-16	1	1102	1	W LANTAU	2	117	ON	HKCRP	811822	801551	SUMMER	NONE	S
8-Jun-16	2	1107	1	W LANTAU	3	426	ON	HKCRP	811136	801013	SUMMER	NONE	S
8-Jun-16	3	1113	3	W LANTAU	2	164	ON	HKCRP	809786	800711	SUMMER	NONE	S
8-Jun-16	4	1136	6	W LANTAU	2	83	ON	HKCRP	805988	800517	SUMMER	NONE	S
14-Jun-16	1	1310	4	SW LANTAU	3	ND	OFF	HKCRP	806457	809562	SUMMER	NONE	
14-Jun-16	2	1338	4	SW LANTAU	3	218	ON	HKCRP	807421	809172	SUMMER	NONE	S
14-Jun-16	3	1400	2	SW LANTAU	3	88	ON	HKCRP	807511	808667	SUMMER	NONE	S
14-Jun-16	4	1428	5	SW LANTAU	3	665	ON	HKCRP	806594	807417	SUMMER	NONE	P
14-Jun-16	5	1537	1	SW LANTAU	2	ND	OFF	HKCRP	803834	809103	SUMMER	NONE	
20-Jun-16	1	1349	1	SW LANTAU	3	635	ON	HKCRP	805497	802506	SUMMER	NONE	P
20-Jun-16	2	1353	8	SW LANTAU	2	14	ON	HKCRP	806150	802569	SUMMER	NONE	P
20-Jun-16	3	1414	2	SW LANTAU	2	889	ON	HKCRP	807065	804458	SUMMER	NONE	S
20-Jun-16	4	1503	12	SW LANTAU	2	462	ON	HKCRP	807868	807337	SUMMER	PURSE-SEINE	P
20-Jun-16	5	1542	2	SW LANTAU	2	155	ON	HKCRP	806481	808520	SUMMER	NONE	P
20-Jun-16	6	1600	3	SW LANTAU	2	158	ON	HKCRP	804245	808423	SUMMER	NONE	S
20-Jun-16	7	1613	1	SW LANTAU	2	ND	OFF	HKCRP	803977	809671	SUMMER	NONE	
28-Jun-16	1	1052	7	W LANTAU	3	83	ON	HKCRP	809221	800916	SUMMER	NONE	S
28-Jun-16	2	1130	7	W LANTAU	3	263	ON	HKCRP	806022	800537	SUMMER	NONE	S
28-Jun-16	3	1215	2	W LANTAU	3	ND	OFF	HKCRP	807474	799675	SUMMER	NONE	
28-Jun-16	4	1236	5	W LANTAU	2	122	ON	HKCRP	809410	800700	SUMMER	NONE	P
28-Jun-16	5	1303	1	W LANTAU	2	104	ON	HKCRP	811445	801787	SUMMER	NONE	P
28-Jun-16	6	1323	4	W LANTAU	2	543	ON	HKCRP	813548	801977	SUMMER	NONE	P
4-Jul-16	1	1043	2	W LANTAU	4	0	ON	HKCRP	809155	800854	SUMMER	NONE	S
4-Jul-16	2	1237	3	W LANTAU	3	161	ON	HKCRP	813734	803287	SUMMER	NONE	S
6-Jul-16	1	1421	3	SW LANTAU	2	ND	OFF	HKCRP	806106	802384	SUMMER	NONE	

Appendix II. (cont'd.)

DATE	STG #	TIME	HRD SZ	AREA	BEAU	PSD	EFFORT	TYPE	NORTHING	EASTING	SEASON	BOAT ASSOC.	P/S
6-Jul-16	2	1504	2	SW LANTAU	2	ND	OFF	HKCRP	806976	804520	SUMMER	NONE	
6-Jul-16	3	1523	5	SW LANTAU	2	52	ON	HKCRP	807462	805191	SUMMER	NONE	S
6-Jul-16	4	1556	3	SW LANTAU	2	ND	OFF	HKCRP	807223	808491	SUMMER	NONE	
8-Jul-16	1	1025	4	W LANTAU	2	265	ON	HKCRP	813170	802626	SUMMER	NONE	S
8-Jul-16	2	1028	3	W LANTAU	2	206	ON	HKCRP	812684	802264	SUMMER	NONE	S
8-Jul-16	3	1032	4	W LANTAU	2	88	ON	HKCRP	811511	801715	SUMMER	NONE	S
8-Jul-16	4	1042	3	W LANTAU	2	163	ON	HKCRP	809453	800958	SUMMER	NONE	S
8-Jul-16	5	1051	2	W LANTAU	2	347	ON	HKCRP	807426	801397	SUMMER	NONE	S
8-Jul-16	6	1054	3	W LANTAU	2	223	ON	HKCRP	806683	801725	SUMMER	NONE	S
13-Jul-16	1	1341	1	SW LANTAU	2	ND	OFF	HKCRP	806118	802146	SUMMER	NONE	
19-Jul-16	1	1345	1	SW LANTAU	2	ND	OFF	HKCRP	805773	808519	SUMMER	NONE	
19-Jul-16	2	1413	1	SW LANTAU	2	8	ON	HKCRP	807589	808182	SUMMER	NONE	S
19-Jul-16	3	1537	3	SW LANTAU	1	ND	OFF	HKCRP	803911	809196	SUMMER	NONE	
27-Jul-16	1	1536	2	NW LANTAU	2	ND	OFF	HKCRP	818884	803061	SUMMER	NONE	
9-Aug-16	1	1316	1	SW LANTAU	2	25	ON	HKCRP	806161	802497	SUMMER	NONE	S
9-Aug-16	2	1328	1	SW LANTAU	2	ND	OFF	HKCRP	807031	804603	SUMMER	NONE	
16-Aug-16	1	1318	1	W LANTAU	2	ND	OFF	HKCRP	805974	802012	SUMMER	NONE	
16-Aug-16	2	1323	1	W LANTAU	2	ND	OFF	HKCRP	806403	803055	SUMMER	NONE	
16-Aug-16	3	1327	2	SW LANTAU	1	69	ON	HKCRP	806546	803519	SUMMER	NONE	P
16-Aug-16	4	1337	2	SW LANTAU	2	93	ON	HKCRP	804841	803433	SUMMER	NONE	P
19-Aug-16	1	1345	6	NW LANTAU	3	10	ON	HKCRP	826438	807527	SUMMER	NONE	P
22-Aug-16	1	1006	1	W LANTAU	2	ND	OFF	HKCRP	816718	806066	SUMMER	NONE	
22-Aug-16	2	1027	2	W LANTAU	2	131	ON	HKCRP	814055	803112	SUMMER	NONE	S
22-Aug-16	3	1036	1	W LANTAU	2	73	ON	HKCRP	812396	802160	SUMMER	NONE	S
22-Aug-16	4	1043	1	W LANTAU	2	11	ON	HKCRP	810903	801559	SUMMER	NONE	S
22-Aug-16	5	1047	4	W LANTAU	2	ND	OFF	HKCRP	810230	800393	SUMMER	NONE	
22-Aug-16	6	1059	1	W LANTAU	2	291	ON	HKCRP	808679	800812	SUMMER	NONE	S
25-Aug-16	1	1019	8	W LANTAU	2	63	ON	HKCRP	812784	802326	SUMMER	NONE	S
25-Aug-16	2	1039	5	W LANTAU	2	201	ON	HKCRP	810405	801476	SUMMER	NONE	S
25-Aug-16	3	1046	5	W LANTAU	2	79	ON	HKCRP	808833	800905	SUMMER	NONE	S
25-Aug-16	4	1106	1	SW LANTAU	3	131	ON	HKCRP	806238	802735	SUMMER	NONE	S
29-Aug-16	1	1151	11	NW LANTAU	2	128	ON	HKCRP	827160	806509	SUMMER	NONE	P
6-Sep-16	4	1501	1	SW LANTAU	1	83	ON	HKCRP	805225	805465	AUTUMN	NONE	P
19-Sep-16	1	1044	3	W LANTAU	4	457	ON	HKCRP	808556	800956	AUTUMN	NONE	S

Appendix II. (cont'd.)

DATE	STG #	TIME	HRD SZ	AREA	BEAU	PSD	EFFORT	TYPE	NORTHING	EASTING	SEASON	BOAT ASSOC.	P/S
20-Sep-16	1	1038	1	W LANTAU	2	66	ON	HKCRP	811799	802056	AUTUMN	NONE	S
20-Sep-16	2	1045	2	W LANTAU	2	71	ON	HKCRP	811378	801942	AUTUMN	NONE	S
26-Sep-16	1	1024	10	W LANTAU	1	91	ON	HKCRP	813281	802678	AUTUMN	NONE	S
26-Sep-16	2	1041	5	W LANTAU	1	41	ON	HKCRP	810715	801383	AUTUMN	NONE	S
26-Sep-16	3	1057	9	W LANTAU	2	96	ON	HKCRP	808557	800739	AUTUMN	NONE	S
26-Sep-16	4	1114	7	W LANTAU	2	161	ON	HKCRP	807748	801119	AUTUMN	NONE	S
26-Sep-16	5	1123	5	W LANTAU	2	323	ON	HKCRP	805941	802043	AUTUMN	NONE	S
26-Sep-16	6	1201	5	SW LANTAU	2	114	ON	HKCRP	805074	803454	AUTUMN	NONE	P
26-Sep-16	7	1216	1	SW LANTAU	2	163	ON	HKCRP	806436	803436	AUTUMN	NONE	P
26-Sep-16	8	1341	1	SW LANTAU	2	76	ON	HKCRP	807410	809347	AUTUMN	NONE	S
14-Oct-16	1	1037	3	W LANTAU	2	109	ON	HKCRP	812839	802244	AUTUMN	NONE	S
14-Oct-16	2	1050	3	W LANTAU	2	46	ON	HKCRP	810384	800826	AUTUMN	NONE	S
14-Oct-16	3	1104	2	W LANTAU	2	231	ON	HKCRP	808657	800492	AUTUMN	NONE	S
24-Oct-16	1	1012	1	W LANTAU	2	23	ON	HKCRP	814452	803866	AUTUMN	NONE	S
24-Oct-16	2	1026	3	W LANTAU	2	71	ON	HKCRP	810770	801394	AUTUMN	NONE	S
24-Oct-16	3	1040	3	W LANTAU	2	625	ON	HKCRP	808900	800884	AUTUMN	NONE	S
24-Oct-16	4	1045	2	W LANTAU	3	312	ON	HKCRP	807493	801314	AUTUMN	NONE	S
25-Oct-16	1	1208	2	NW LANTAU	2	281	ON	HKCRP	825955	805414	AUTUMN	NONE	P
25-Oct-16	2	1347	1	W LANTAU	3	99	ON	HKCRP	813911	803184	AUTUMN	NONE	S
25-Oct-16	3	1452	7	W LANTAU	4	281	ON	HKCRP	807439	800458	AUTUMN	NONE	P
25-Oct-16	4	1556	6	W LANTAU	3	175	ON	HKCRP	810054	799691	AUTUMN	NONE	S
25-Oct-16	5	1640	1	W LANTAU	3	48	ON	HKCRP	814478	802196	AUTUMN	NONE	P
26-Oct-16	1	1020	6	W LANTAU	2	86	ON	HKCRP	813690	802864	AUTUMN	NONE	S
26-Oct-16	2	1023	1	W LANTAU	2	52	ON	HKCRP	812806	802378	AUTUMN	NONE	S
26-Oct-16	3	1027	3	W LANTAU	2	65	ON	HKCRP	811899	801922	AUTUMN	NONE	S
26-Oct-16	4	1031	1	W LANTAU	2	110	ON	HKCRP	810870	801415	AUTUMN	NONE	S
26-Oct-16	5	1046	2	W LANTAU	3	106	ON	HKCRP	806495	801735	AUTUMN	NONE	S
31-Oct-16	1	1011	2	NW LANTAU	2	124	ON	HKCRP	814916	804681	AUTUMN	NONE	P
9-Nov-16	1	1038	1	W LANTAU	2	182	ON	HKCRP	814534	801804	AUTUMN	NONE	P
9-Nov-16	2	1111	1	W LANTAU	3	72	ON	HKCRP	810736	801610	AUTUMN	NONE	S
9-Nov-16	3	1132	2	W LANTAU	3	218	ON	HKCRP	809036	799462	AUTUMN	NONE	S
9-Nov-16	4	1225	1	SW LANTAU	3	ND	OFF	HKCRP	806172	802404	AUTUMN	NONE	
10-Nov-16	1	1325	2	NW LANTAU	3	332	ON	HKCRP	824487	808399	AUTUMN	NONE	P
11-Nov-16	1	1501	1	SW LANTAU	2	129	ON	HKCRP	806183	808035	AUTUMN	NONE	S

Appendix II. (cont'd.)

DATE	STG #	TIME	HRD SZ	AREA	BEAU	PSD	EFFORT	TYPE	NORTHING	EASTING	SEASON	BOAT ASSOC.	P/S
25-Nov-16	1	1143	7	W LANTAU	3	ND	OFF	HKCRP	806107	801816	AUTUMN	NONE	
25-Nov-16	2	1216	1	SW LANTAU	2	689	ON	HKCRP	807074	805263	AUTUMN	NONE	S
25-Nov-16	3	1224	2	SW LANTAU	2	254	ON	HKCRP	807149	806882	AUTUMN	NONE	S
2-Dec-16	1	1400	2	SW LANTAU	2	437	ON	HKCRP	804551	804515	WINTER	NONE	P
7-Dec-16	1	1023	2	W LANTAU	3	82	ON	HKCRP	813848	801586	WINTER	NONE	S
7-Dec-16	2	1031	4	W LANTAU	3	401	ON	HKCRP	813615	801689	WINTER	NONE	P
7-Dec-16	3	1059	3	W LANTAU	3	930	ON	HKCRP	811565	802488	WINTER	NONE	S
7-Dec-16	4	1105	2	W LANTAU	3	138	ON	HKCRP	811467	801705	WINTER	NONE	P
7-Dec-16	5	1201	2	W LANTAU	3	575	ON	HKCRP	805521	801702	WINTER	NONE	P
7-Dec-16	6	1230	2	SW LANTAU	2	614	ON	HKCRP	806613	803416	WINTER	NONE	P
7-Dec-16	7	1243	1	SW LANTAU	2	140	ON	HKCRP	805816	803383	WINTER	NONE	P
7-Dec-16	8	1344	3	SW LANTAU	2	33	ON	HKCRP	807936	806378	WINTER	NONE	S
9-Dec-16	1	1506	4	SW LANTAU	3	ND	OFF	HKCRP	806315	802951	WINTER	NONE	
13-Dec-16	1	1126	3	SW LANTAU	2	146	ON	HKCRP	802657	804583	WINTER	NONE	P
13-Dec-16	2	1230	2	SW LANTAU	2	219	ON	HKCRP	803429	806493	WINTER	NONE	P
13-Dec-16	3	1308	2	SW LANTAU	3	90	ON	HKCRP	800770	807210	WINTER	PAIR	S
13-Dec-16	4	1336	2	SW LANTAU	3	87	ON	HKCRP	803668	808680	WINTER	NONE	S
3-Jan-17	1	1025	1	W LANTAU	2	615	ON	HKCRP	812639	802439	WINTER	NONE	S
3-Jan-17	2	1035	5	W LANTAU	2	321	ON	HKCRP	811744	801561	WINTER	NONE	S
3-Jan-17	3	1103	1	W LANTAU	2	88	ON	HKCRP	811247	801117	WINTER	NONE	S
3-Jan-17	4	1108	1	W LANTAU	2	43	ON	HKCRP	810705	801023	WINTER	NONE	S
3-Jan-17	5	1112	2	W LANTAU	2	404	ON	HKCRP	810162	800949	WINTER	NONE	S
4-Jan-17	1	1039	3	W LANTAU	2	210	ON	HKCRP	812485	801975	WINTER	NONE	P
4-Jan-17	2	1102	13	W LANTAU	2	228	ON	HKCRP	811919	802561	WINTER	NONE	S
4-Jan-17	3	1151	6	W LANTAU	3	328	ON	HKCRP	808382	799770	WINTER	NONE	P
4-Jan-17	4	1311	6	W LANTAU	3	281	ON	HKCRP	810243	799609	WINTER	NONE	S
4-Jan-17	5	1346	1	W LANTAU	2	224	ON	HKCRP	815438	803713	WINTER	NONE	P
4-Jan-17	6	1428	3	NW LANTAU	2	175	ON	HKCRP	823496	805482	WINTER	NONE	P
9-Jan-17	1	1403	8	SW LANTAU	2	ND	OFF	HKCRP	806073	802249	WINTER	NONE	
13-Jan-17	1	1049	7	NW LANTAU	3	162	ON	HKCRP	826542	805364	WINTER	NONE	S
17-Jan-17	1	1010	3	W LANTAU	2	ND	OFF	HKCRP	814916	804516	WINTER	NONE	
17-Jan-17	2	1038	12	W LANTAU	3	504	ON	HKCRP	813207	801193	WINTER	NONE	S
17-Jan-17	3	1120	1	W LANTAU	3	155	ON	HKCRP	812487	801181	WINTER	NONE	P
17-Jan-17	4	1148	3	W LANTAU	2	427	ON	HKCRP	810474	800373	WINTER	NONE	P

Appendix II. (cont'd.)

DATE	STG #	TIME	HRD SZ	AREA	BEAU	PSD	EFFORT	TYPE	NORTHING	EASTING	SEASON	BOAT ASSOC.	P/S
17-Jan-17	5	1219	2	W LANTAU	2	47	ON	HKCRP	810298	799733	WINTER	NONE	S
17-Jan-17	6	1352	1	SW LANTAU	2	323	ON	HKCRP	804401	807423	WINTER	NONE	P
19-Jan-17	2	1344	1	SE LANTAU	2	220	ON	HKCRP	805482	817573	WINTER	NONE	P
23-Jan-17	1	1127	5	NW LANTAU	3	17	ON	HKCRP	831250	804694	WINTER	NONE	P
23-Jan-17	2	1315	7	NW LANTAU	3	641	ON	HKCRP	828921	806481	WINTER	NONE	P
26-Jan-17	3	1450	3	SE LANTAU	3	14	ON	HKCRP	806475	812542	WINTER	NONE	P
1-Feb-17	1	1009	1	NW LANTAU	2	ND	OFF	HKCRP	816631	805231	WINTER	NONE	
1-Feb-17	2	1043	2	W LANTAU	3	ND	OFF	HKCRP	813505	801575	WINTER	NONE	
1-Feb-17	3	1057	1	W LANTAU	3	191	ON	HKCRP	813527	801627	WINTER	NONE	P
1-Feb-17	6	1444	2	SW LANTAU	2	1105	ON	HKCRP	805658	810592	WINTER	NONE	P
1-Feb-17	7	1541	2	SW LANTAU	2	176	ON	HKCRP	805612	811530	WINTER	NONE	P
3-Feb-17	1	1032	1	NW LANTAU	2	ND	OFF	HKCRP	822931	805511	WINTER	NONE	
6-Feb-17	1	1050	11	W LANTAU	3	60	ON	HKCRP	808612	800812	WINTER	PURSE-SEINE	S
17-Feb-17	1	1007	1	NW LANTAU	2	54	ON	HKCRP	815523	805599	WINTER	NONE	S
17-Feb-17	2	1030	1	W LANTAU	2	58	ON	HKCRP	813271	802276	WINTER	NONE	S
17-Feb-17	3	1038	4	W LANTAU	2	35	ON	HKCRP	812110	801562	WINTER	NONE	S
17-Feb-17	4	1052	1	W LANTAU	2	ND	OFF	HKCRP	812086	802057	WINTER	NONE	
17-Feb-17	5	1101	5	W LANTAU	2	999	ON	HKCRP	810881	801343	WINTER	NONE	S
17-Feb-17	6	1116	4	W LANTAU	2	1	ON	HKCRP	808435	800863	WINTER	NONE	S
17-Feb-17	7	1134	2	W LANTAU	3	25	ON	HKCRP	806529	801518	WINTER	NONE	S
17-Feb-17	8	1145	1	SW LANTAU	3	ND	OFF	HKCRP	806184	802322	WINTER	NONE	
17-Feb-17	11	1308	2	SW LANTAU	2	1005	ON	HKCRP	807068	808542	WINTER	NONE	P
27-Feb-17	1	1051	2	NW LANTAU	3	341	ON	HKCRP	824738	804732	WINTER	NONE	P
1-Mar-17	1	1308	3	SW LANTAU	3	181	ON	HKCRP	804145	802627	SPRING	PAIR	P
1-Mar-17	2	1529	1	SW LANTAU	2	ND	OFF	HKCRP	804097	810476	SPRING	PURSE-SEINE	
6-Mar-17	1	1043	4	W LANTAU	1	94	ON	HKCRP	808191	800914	SPRING	PURSE-SEINE	S
13-Mar-17	1	1307	1	SW LANTAU	2	ND	OFF	HKCRP	806260	802931	SPRING	PURSE-SEINE	
21-Mar-17	1	1023	4	W LANTAU	1	156	ON	HKCRP	813579	803070	SPRING	NONE	S
21-Mar-17	2	1042	7	W LANTAU	1	76	ON	HKCRP	808978	800833	SPRING	NONE	S
24-Mar-17	1	1015	2	NW LANTAU	2	1129	ON	HKCRP	815270	804589	SPRING	PURSE-SEINE	P

Appendix III. HKCRP-AFCD Finless Porpoise Sighting Database (April 2016 - March 2017)
(Note: P = sightings made on primary lines; S = sightings made on secondary lines)

DATE	STG #	TIME	HRD SZ	NORTHING	EASTING	AREA	BEAU	PSD	EFFORT	SEASON	P/S
1-Apr-16	1	1025	3	805048	819460	SE LANTAU	1	457	ON	SPRING	P
1-Apr-16	2	1138	7	806659	815502	SE LANTAU	1	126	ON	SPRING	P
1-Apr-16	3	1151	1	805463	815500	SE LANTAU	2	131	ON	SPRING	P
1-Apr-16	4	1222	5	802952	813475	SE LANTAU	2	28	ON	SPRING	P
1-Apr-16	5	1305	6	808542	814556	SE LANTAU	1	ND	OFF	SPRING	
1-Apr-16	6	1514	5	806475	820957	LAMMA	1	224	ON	SPRING	P
1-Apr-16	7	1527	7	806496	822360	LAMMA	2	325	ON	SPRING	P
1-Apr-16	8	1628	2	808442	825455	LAMMA	2	195	ON	SPRING	P
8-Apr-16	1	1235	1	802461	828091	LAMMA	2	75	ON	SPRING	P
8-Apr-16	2	1440	2	805444	821812	LAMMA	1	80	ON	SPRING	P
8-Apr-16	3	1503	17	806484	822535	LAMMA	1	82	ON	SPRING	P
8-Apr-16	4	1634	1	807989	823835	LAMMA	1	79	ON	SPRING	S
20-Apr-16	3	1606	1	804060	813023	SE LANTAU	2	ND	OFF	SPRING	
27-Apr-16	1	1038	1	804916	818511	SE LANTAU	1	87	ON	SPRING	P
27-Apr-16	2	1123	1	805110	814510	SE LANTAU	1	149	ON	SPRING	P
27-Apr-16	3	1128	5	805508	814490	SE LANTAU	1	88	ON	SPRING	P
27-Apr-16	4	1144	2	807103	814502	SE LANTAU	1	57	ON	SPRING	P
27-Apr-16	5	1242	3	801748	811493	SW LANTAU	2	103	ON	SPRING	P
27-Apr-16	6	1300	1	801053	809542	SW LANTAU	2	74	ON	SPRING	P
27-Apr-16	7	1458	3	805809	813511	SE LANTAU	2	116	ON	SPRING	P
27-Apr-16	8	1630	1	805687	822410	SE LANTAU	2	ND	OFF	SPRING	
5-May-16	1	1354	1	805445	821286	LAMMA	2	202	ON	SPRING	P
5-May-16	2	1358	2	805445	820966	LAMMA	2	31	ON	SPRING	P
5-May-16	3	1409	1	806342	820751	LAMMA	2	97	ON	SPRING	S
5-May-16	4	1526	2	807392	823092	LAMMA	2	180	ON	SPRING	P
5-May-16	5	1616	1	809583	825424	LAMMA	2	12	ON	SPRING	P
9-May-16	1	1535	2	802141	825976	LAMMA	2	ND	OFF	SPRING	
11-May-16	1	1131	3	805067	813582	SE LANTAU	2	54	ON	SPRING	S
11-May-16	2	1138	12	806152	813470	SE LANTAU	2	41	ON	SPRING	P
11-May-16	3	1213	3	807772	811513	SW LANTAU	2	229	ON	SPRING	P
11-May-16	4	1230	3	804405	811518	SW LANTAU	2	280	ON	SPRING	P
18-May-16	7	1521	1	806360	815491	SE LANTAU	2	3	ON	SPRING	P
18-May-16	8	1539	12	806392	815801	SE LANTAU	2	ND	OFF	SPRING	
23-May-16	1	1141	9	805454	823823	LAMMA	3	134	ON	SPRING	S
14-Jun-16	6	1602	2	804379	814602	SE LANTAU	2	ND	OFF	SUMMER	
22-Jul-16	1	1351	1	804499	846626	PO TOI	2	131	ON	SUMMER	P
25-Jul-16	1	1155	3	823615	866350	SAI KUNG	1	545	ON	SUMMER	P
25-Jul-16	2	1206	1	823530	868204	SAI KUNG	1	116	ON	SUMMER	P
25-Jul-16	3	1420	1	817522	865115	SAI KUNG	2	593	ON	SUMMER	P
8-Aug-16	1	1039	3	805697	849646	PO TOI	2	90	ON	SUMMER	P
25-Aug-16	5	1203	1	801023	807840	SW LANTAU	2	129	ON	SUMMER	S
25-Aug-16	6	1210	2	801055	808572	SW LANTAU	2	277	ON	SUMMER	S
25-Aug-16	7	1318	1	803586	811517	SW LANTAU	2	4	ON	SUMMER	P
25-Aug-16	8	1336	1	801523	813370	SE LANTAU	2	ND	OFF	SUMMER	
31-Aug-16	1	1107	2	809429	859077	NINEPINS	1	365	ON	SUMMER	P
31-Aug-16	2	1133	2	809427	864758	NINEPINS	1	118	ON	SUMMER	P
31-Aug-16	3	1145	3	809475	866851	NINEPINS	1	86	ON	SUMMER	P
31-Aug-16	4	1219	2	811572	863352	NINEPINS	1	114	ON	SUMMER	P
6-Sep-16	1	1227	2	801426	811874	SE LANTAU	2	ND	OFF	AUTUMN	
6-Sep-16	2	1229	3	801726	811524	SW LANTAU	2	98	ON	AUTUMN	P
6-Sep-16	3	1354	6	800667	808881	SW LANTAU	2	41	ON	AUTUMN	S
30-Sep-16	1	1231	5	806588	854286	PO TOI	2	212	ON	AUTUMN	P
30-Sep-16	2	1251	7	806496	850997	PO TOI	1	44	ON	AUTUMN	P
30-Sep-16	3	1309	2	806416	848058	PO TOI	1	163	ON	AUTUMN	P
30-Sep-16	4	1351	2	808389	851211	NINEPINS	1	29	ON	AUTUMN	P
6-Oct-16	1	1111	8	805262	816449	SE LANTAU	2	94	ON	AUTUMN	P
6-Oct-16	2	1226	1	801491	813133	SE LANTAU	2	ND	ON	AUTUMN	S
6-Oct-16	3	1235	3	802798	812454	SE LANTAU	2	56	ON	AUTUMN	P

Appendix III. (cont'd)

DATE	STG #	TIME	HRD SZ	NORTHING	EASTING	AREA	BEAU	PSD	EFFORT	SEASON	P/S
6-Oct-16	4	1325	3	807375	810553	SW LANTAU	2	265	ON	AUTUMN	P
6-Oct-16	5	1358	1	800465	810521	SW LANTAU	2	46	ON	AUTUMN	P
14-Nov-16	1	1630	4	808150	817845	SE LANTAU	2	ND	OFF	AUTUMN	
15-Nov-16	1	1204	2	804497	855939	PO TOI	2	231	ON	AUTUMN	P
21-Nov-16	1	1250	1	803666	809712	SW LANTAU	4	6	ON	AUTUMN	P
25-Nov-16	4	1348	1	802640	814579	SE LANTAU	2	158	ON	AUTUMN	P
25-Nov-16	5	1442	2	805838	816233	SE LANTAU	2	109	ON	AUTUMN	S
25-Nov-16	6	1451	1	804454	816479	SE LANTAU	2	24	ON	AUTUMN	P
29-Nov-16	1	1100	1	804719	816510	SE LANTAU	2	48	ON	AUTUMN	P
29-Nov-16	2	1108	1	805794	816347	SE LANTAU	2	32	ON	AUTUMN	S
29-Nov-16	3	1222	1	801647	812442	SE LANTAU	3	70	ON	AUTUMN	P
7-Dec-16	9	1707	5	811683	831787	LAMMA	2	ND	OFF	WINTER	
8-Dec-16	1	1215	1	804907	829598	LAMMA	2	79	ON	WINTER	S
8-Dec-16	2	1439	1	801510	814763	SE LANTAU	2	26	ON	WINTER	S
13-Dec-16	5	1455	2	802688	812330	SE LANTAU	2	41	ON	WINTER	P
13-Dec-16	6	1602	3	804312	814952	SE LANTAU	2	ND	OFF	WINTER	
5-Jan-17	1	1021	8	805658	818440	SE LANTAU	2	182	ON	WINTER	P
19-Jan-17	1	1335	1	804519	817582	SE LANTAU	2	48	ON	WINTER	P
19-Jan-17	3	1359	1	806855	817523	SE LANTAU	2	ND	OFF	WINTER	
19-Jan-17	4	1436	1	806681	815502	SE LANTAU	2	ND	OFF	WINTER	
19-Jan-17	5	1513	2	801511	814505	SE LANTAU	2	66	ON	WINTER	S
19-Jan-17	6	1525	2	802177	813454	SE LANTAU	2	114	ON	WINTER	P
19-Jan-17	7	1550	1	804000	815818	SE LANTAU	2	ND	OFF	WINTER	
26-Jan-17	1	1315	1	806658	815904	SE LANTAU	2	267	ON	WINTER	S
26-Jan-17	2	1357	3	803305	814476	SE LANTAU	3	48	ON	WINTER	P
26-Jan-17	4	1521	2	802366	812453	SE LANTAU	3	7	ON	WINTER	P
26-Jan-17	5	1558	1	804497	817479	SE LANTAU	3	ND	OFF	WINTER	
1-Feb-17	4	1355	1	803482	807401	SW LANTAU	2	58	ON	WINTER	P
1-Feb-17	5	1428	2	802017	809564	SW LANTAU	2	ND	OFF	WINTER	
1-Feb-17	8	1612	1	805449	817594	SE LANTAU	3	ND	OFF	WINTER	
17-Feb-17	9	1223	3	801135	807417	SW LANTAU	2	364	ON	WINTER	S
17-Feb-17	10	1242	3	802142	807729	SW LANTAU	2	169	ON	WINTER	S
17-Feb-17	12	1340	1	803111	810495	SW LANTAU	2	345	ON	WINTER	P
17-Feb-17	13	1344	5	802292	810493	SW LANTAU	1	179	ON	WINTER	P
17-Feb-17	14	1353	7	801605	810554	SW LANTAU	1	273	ON	WINTER	P
17-Feb-17	15	1403	1	800895	811306	SW LANTAU	1	ND	OFF	WINTER	
17-Feb-17	16	1405	2	801039	811657	SW LANTAU	1	ND	OFF	WINTER	
17-Feb-17	17	1414	1	801811	813494	SE LANTAU	1	369	ON	WINTER	P
17-Feb-17	18	1418	1	802254	813526	SE LANTAU	1	156	ON	WINTER	P
17-Feb-17	19	1424	2	802885	813393	SE LANTAU	1	493	ON	WINTER	P
17-Feb-17	20	1428	2	803439	813466	SE LANTAU	1	375	ON	WINTER	P
17-Feb-17	21	1437	1	804945	813478	SE LANTAU	2	ND	OFF	WINTER	
17-Feb-17	22	1523	3	805894	815553	SE LANTAU	1	83	ON	WINTER	P
17-Feb-17	23	1527	5	805407	815603	SE LANTAU	2	74	ON	WINTER	P
23-Feb-17	1	1308	2	804895	817552	SE LANTAU	2	130	ON	WINTER	P
1-Mar-17	1	1128	1	805444	821647	LAMMA	2	4	ON	SPRING	P
1-Mar-17	2	1425	1	806713	815811	SE LANTAU	2	53	ON	SPRING	S
1-Mar-17	3	1434	5	805539	816491	SE LANTAU	2	119	ON	SPRING	P
1-Mar-17	4	1442	2	804609	816479	SE LANTAU	2	116	ON	SPRING	P
1-Mar-17	5	1509	1	801666	814474	SE LANTAU	2	96	ON	SPRING	P
1-Mar-17	6	1531	2	806095	814532	SE LANTAU	2	7	ON	SPRING	P
1-Mar-17	3	1559	1	802345	812154	SW LANTAU	2	ND	OFF	SPRING	
1-Mar-17	4	1626	1	804905	818800	SE LANTAU	2	ND	OFF	SPRING	
1-Mar-17	5	1646	1	807182	823082	LAMMA	2	ND	OFF	SPRING	
6-Mar-17	2	1607	1	808310	814391	SE LANTAU	2	ND	OFF	SPRING	
10-Mar-17	1	1004	1	804430	832939	LAMMA	3	25	ON	SPRING	S
10-Mar-17	2	1110	6	806189	819441	SE LANTAU	3	148	ON	SPRING	P
10-Mar-17	3	1229	1	806038	815470	SE LANTAU	2	24	ON	SPRING	P
10-Mar-17	4	1301	6	808500	813422	SE LANTAU	2	87	ON	SPRING	P
10-Mar-17	5	1322	2	805100	813448	SE LANTAU	2	30	ON	SPRING	P
10-Mar-17	6	1334	4	803307	813094	SE LANTAU	3	112	ON	SPRING	S
10-Mar-17	7	1343	1	804183	812394	SE LANTAU	2	22	ON	SPRING	P
10-Mar-17	8	1352	3	805666	812417	SE LANTAU	2	151	ON	SPRING	P
10-Mar-17	9	1429	1	808188	814628	SE LANTAU	2	70	ON	SPRING	P

Appendix III. (cont'd)

DATE	STG #	TIME	HRD SZ	NORTHING	EASTING	AREA	BEAU	PSD	EFFORT	SEASON	P/S
10-Mar-17	10	1455	5	802851	814476	SE LANTAU	3	96	ON	SPRING	P
10-Mar-17	11	1529	10	806237	816069	SE LANTAU	2	31	ON	SPRING	S
13-Mar-17	2	1454	1	802249	809678	SW LANTAU	2	96	ON	SPRING	P
13-Mar-17	3	1523	4	807717	810884	SW LANTAU	2	141	ON	SPRING	S
13-Mar-17	4	1536	1	807727	811791	SE LANTAU	1	ND	OFF	SPRING	
13-Mar-17	5	1600	2	807929	818195	SE LANTAU	1	ND	OFF	SPRING	
21-Mar-17	3	1203	3	802116	809719	SW LANTAU	2	145	ON	SPRING	P
21-Mar-17	4	1307	3	803143	811536	SW LANTAU	2	147	ON	SPRING	P
21-Mar-17	5	1312	3	802534	811608	SW LANTAU	2	160	ON	SPRING	P
21-Mar-17	6	1315	3	802080	811607	SW LANTAU	2	6	ON	SPRING	P
21-Mar-17	7	1346	5	806650	813594	SE LANTAU	2	35	ON	SPRING	P
21-Mar-17	8	1414	1	808940	815515	SE LANTAU	2	113	ON	SPRING	P
21-Mar-17	9	1429	1	806016	815481	SE LANTAU	2	ND	OFF	SPRING	

Appendix IV. Individual dolphins identified during AFCD surveys (April 2016 to March 2017)

(***in bold & italics: new individuals***)

DOLPHIN ID	DATE	STG#	AREA
CH12	03/06/16	2	SWL
	26/09/16	3	WL
	07/12/16	5	WL
	04/01/17	2	WL
	09/01/17	1	SWL
CH34	19/08/16	1	NWL
	29/08/16	1	NWL
	10/11/16	1	NWL
	23/01/17	2	NWL
CH38	14/06/16	4	SWL
	26/09/16	3	WL
	09/01/17	1	SWL
	06/02/17	1	WL
CH105	03/01/17	2	WL
CH108	06/04/16	1	WL
	03/06/16	1	WL
	09/01/17	1	SWL
	17/02/17	6	WL
	21/03/17	2	WL
CH113	08/06/16	3	WL
NL12	19/08/16	1	NWL
	23/01/17	1	NWL
NL33	20/06/16	2	SWL
	09/12/16	1	SWL
NL37	06/04/16	1	WL
	26/09/16	1	WL
NL46	13/01/17	1	NWL
NL49	13/01/17	1	NWL
NL80	23/01/17	1	NWL
NL98	18/05/16	4	WL
	04/01/17	5	WL
	21/03/17	2	WL
NL104	29/08/16	1	NWL
	23/01/17	2	NWL
NL105	17/01/17	2	WL
NL120	20/06/16	4	SWL
	25/11/16	3	SWL
	21/03/17	2	WL
NL123	18/05/16	4	WL
	25/08/16	1	WL
	03/01/17	3	WL
NL136	19/08/16	1	NWL
	23/01/17	2	NWL
NL150	20/06/16	2	SWL
	04/07/16	2	WL
NL165	26/04/16	2	WL
	26/09/16	1	WL
NL182	19/08/16	1	NWL
	03/01/17	3	WL
	23/01/17	2	NWL
NL202	29/08/16	1	NWL
	27/02/17	1	NWL
NL206	20/06/16	2	SWL
	25/11/16	1	WL
NL210	26/04/16	2	WL
	29/08/16	1	NWL
NL212	06/04/16	1	WL
	04/01/17	2	WL
	17/01/17	4	WL
NL220	19/08/16	1	NWL
NL224	01/02/17	3	WL
NL226	20/06/16	4	SWL
	04/01/17	6	NWL
NL233	19/08/16	1	NWL
NL242	06/04/16	1	WL
	18/05/16	4	WL
NL247	25/08/16	1	WL
NL249	25/08/16	3	WL

DOLPHIN ID	DATE	STG#	AREA
NL259	06/04/16	1	WL
	17/01/17	1	WL
NL260	06/04/16	1	WL
	26/04/16	2	WL
NL261	04/01/17	6	NWL
NL264	17/01/17	1	WL
	17/02/17	3	WL
NL269	28/06/16	2	WL
	25/08/16	3	WL
	26/09/16	5	WL
	26/09/16	6	SWL
	13/01/17	1	NWL
NL272	04/01/17	6	NWL
NL286	29/08/16	1	NWL
	27/02/17	1	NWL
NL288	17/01/17	1	WL
NL288	17/02/17	3	WL
NL293	18/05/16	1	WL
	07/06/16	1	WL
	28/06/16	1	WL
	26/09/16	3	WL
NL295	06/04/16	1	WL
	26/04/16	2	WL
NL296	06/04/16	1	WL
	04/05/16	2	WL
	01/02/17	2	WL
	17/02/17	3	WL
NL301	28/06/16	4	WL
	23/01/17	1	NWL
NL303	04/07/16	1	WL
NL306	18/05/16	6	SEL
	25/05/16	2	SEL
NL308	23/01/17	1	NWL
NL311	26/04/16	2	WL
	18/05/16	1	WL
NL313	28/06/16	1	WL
NL320	13/01/17	1	NWL
NL321	29/08/16	1	NWL
	23/01/17	2	NWL
NL322	09/12/16	1	SWL
NL325	***04/05/16***	***2***	***WL***
	28/06/16	***1***	***WL***
NL327	***29/08/16***	***1***	***NWL***
NL328	***13/01/17***	***1***	***NWL***
SL05	06/04/16	2	WL
	09/11/16	4	SWL
	11/11/16	1	SWL
SL40	03/06/16	1	WL
	26/09/16	3	WL
	24/10/16	2	WL
	04/01/17	3	WL
	06/02/17	1	WL
SL43	17/01/17	2	WL
SL44	20/04/16	2	SWL
	06/05/16	5	WL
	25/10/16	3	WL
	04/01/17	3	WL
SL47	20/06/16	4	SWL
SL54	20/06/16	4	SWL
SL55	25/05/16	1	SWL
	14/06/16	2	SWL
SL59	06/04/16	1	WL
	08/06/16	4	WL
	25/11/16	1	WL
SL60	26/09/16	3	WL
	13/12/16	4	SWL
SL61	***17/02/17***	***1***	***WL***

DOLPHIN ID	DATE	STG#	AREA
SL64	***13/12/16***	***1***	***SWL***
WL05	06/04/16	1	WL
	18/05/16	1	WL
WL15	22/04/16	3	WL
	04/05/16	5	SWL
	14/06/16	4	SWL
	09/11/16	2	WL
	07/12/16	8	SWL
WL17	13/01/17	1	NWL
WL21	04/05/16	6	WL
	18/05/16	1	WL
	07/06/16	4	WL
WL42	25/10/16	3	WL
	06/02/17	1	WL
	17/02/17	6	WL
	21/03/17	2	WL
WL44	06/02/17	1	WL
WL46	26/04/16	2	WL
	04/05/16	6	WL
	14/06/16	3	SWL
	28/06/16	4	WL
	03/01/17	2	WL
WL47	14/06/16	2	SWL
	20/06/16	4	SWL
	13/12/16	1	SWL
WL58	26/09/16	2	WL
WL61	06/07/16	3	SWL
WL62	25/05/16	1	SWL
	06/07/16	2	SWL
	19/07/16	3	SWL
	13/12/16	1	SWL
	26/01/17	3	SEL
	01/02/17	6	SWL
	01/02/17	7	SWL
	13/03/17	1	SWL
WL68	20/04/16	2	SWL
	14/06/16	1	SWL
	25/10/16	3	WL
WL69	25/11/16	3	SWL
	26/01/17	3	SEL
WL72	06/04/16	1	WL
	25/10/16	3	WL
	04/01/17	2	WL
	04/01/17	4	WL
	06/02/17	1	WL
WL74	20/06/16	2	SWL
WL76	26/09/16	2	WL
WL79	28/06/16	1	WL
	06/03/17	1	WL
	21/03/17	1	WL
WL91	26/04/16	3	WL
	25/05/16	1	SWL
	20/06/16	6	SWL
	28/06/16	2	WL
	06/07/16	1	SWL
	06/07/16	3	SWL
	26/01/17	3	SEL
	01/02/17	6	SWL
WL92	06/07/16	4	SWL
	04/01/17	4	WL
WL94	14/04/16	1	WL
	26/09/16	3	WL
	09/11/16	3	WL
	07/12/16	7	SWL
	17/01/17	5	WL
WL97	17/01/17	2	WL
WL98	18/05/16	1	WL

Appendix IV. (cont'd)

(*in bold & italics: new individuals*)

DOLPHIN ID	DATE	STG#	AREA
WL109	18/05/16	2	WL
	25/10/16	4	WL
	04/01/17	2	WL
	17/01/17	4	WL
	06/02/17	1	WL
	17/02/17	6	WL
WL114	04/05/16	6	WL
WL116	14/06/16	4	SWL
WL118	25/11/16	1	WL
WL123	20/04/16	1	WL
	04/05/16	6	WL
	18/05/16	4	WL
	25/08/16	3	WL
	13/12/16	2	SWL
	13/12/16	4	SWL
	17/02/17	7	WL
	21/03/17	2	WL
WL124	04/05/16	6	WL
WL128	08/06/16	4	WL
	14/06/16	4	SWL
	25/11/16	1	WL
WL130	26/04/16	3	WL
	17/02/17	4	WL
WL131	04/05/16	3	WL
	04/05/16	6	WL
	18/05/16	2	WL
	14/06/16	4	SWL
	20/06/16	2	SWL
	06/07/16	1	SWL
	06/07/16	3	SWL
	26/09/16	3	WL
	25/11/16	1	WL
	09/01/17	1	SWL
	06/02/17	1	WL
WL137	14/04/16	1	WL
WL142	20/04/16	2	SWL
	28/06/16	3	WL
	17/01/17	2	WL
WL144	08/06/16	4	WL
WL145	26/09/16	1	WL
WL152	04/05/16	3	WL
	04/05/16	4	SWL
	03/06/16	2	SWL
	06/07/16	1	SWL
	06/07/16	3	SWL
	07/12/16	5	WL
	07/12/16	6	SWL
	04/01/17	4	WL
	09/01/17	1	SWL
	06/02/17	1	WL
	17/02/17	7	WL
WL166	20/06/16	4	SWL
	09/01/17	1	SWL
WL168	20/04/16	2	SWL
	04/05/16	3	WL
	04/05/16	4	SWL
	14/06/16	1	SWL
	16/08/16	3	SWL
	25/11/16	1	WL
WL173	04/05/16	3	WL
	04/05/16	6	WL
	18/05/16	4	WL
	20/06/16	4	SWL
	14/10/16	2	WL
	09/01/17	1	SWL
	06/02/17	1	WL
WL176	26/09/16	1	WL
WL178	19/07/16	2	SWL

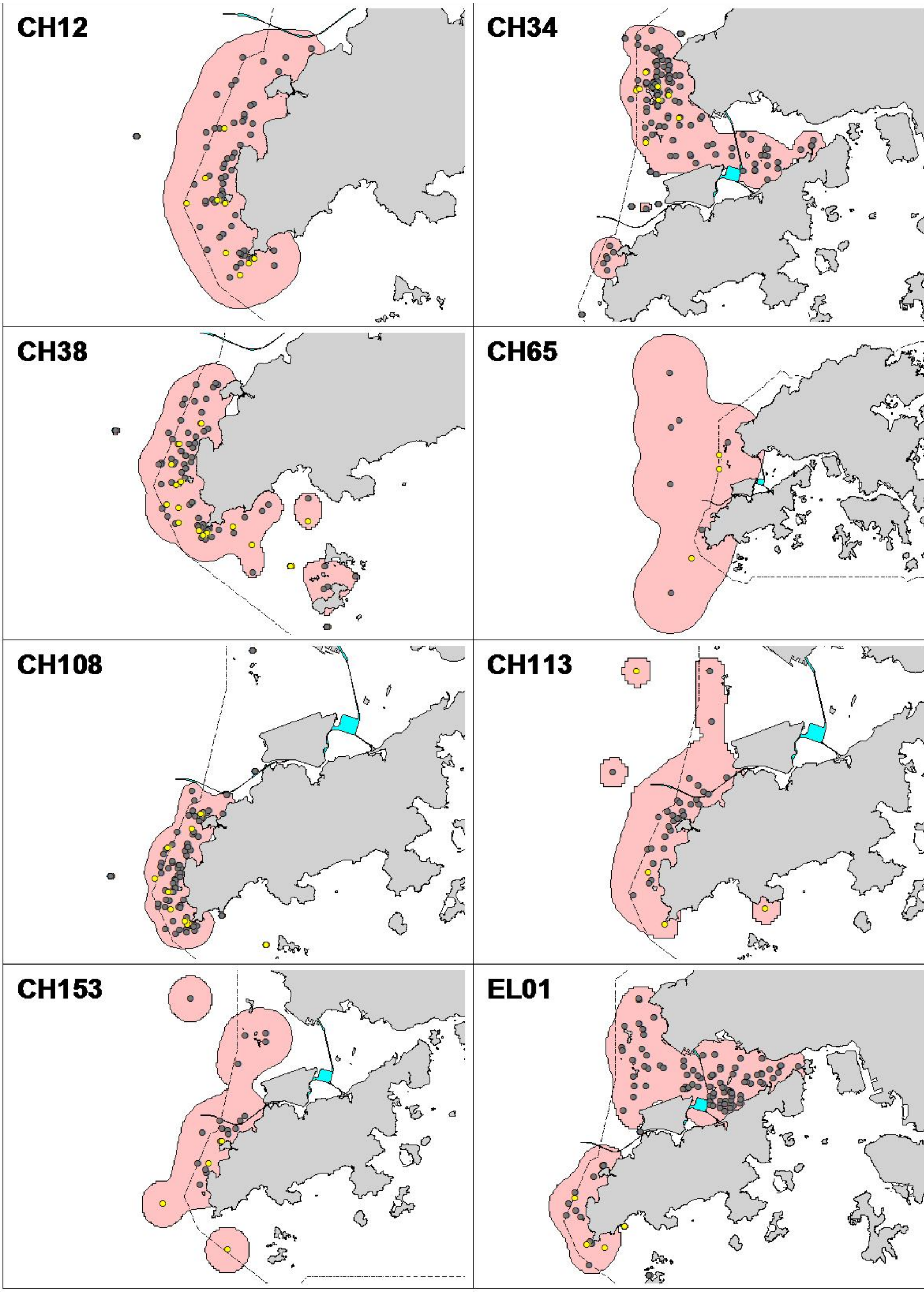
DOLPHIN ID	DATE	STG#	AREA
WL179	26/09/16	1	WL
	26/10/16	3	WL
WL180	14/10/16	2	WL
	24/10/16	2	WL
	25/11/16	1	WL
	04/01/17	3	WL
	04/01/17	4	WL
	17/01/17	2	WL
	06/02/17	1	WL
WL188	23/01/17	1	NWL
WL191	04/01/17	2	WL
WL193	06/03/17	1	WL
WL199	25/10/16	3	WL
	09/01/17	1	SWL
WL200	26/09/16	1	WL
	04/01/17	2	WL
WL206	04/01/17	4	WL
WL207	04/05/16	6	WL
	08/06/16	3	WL
WL208	20/06/16	4	SWL
	25/10/16	4	WL
	09/01/17	1	SWL
WL210	04/05/16	3	WL
	20/06/16	4	SWL
	19/07/16	3	SWL
WL211	20/04/16	1	WL
WL213	26/09/16	1	WL
WL215	14/04/16	1	WL
WL216	18/05/16	2	WL
	14/06/16	3	SWL
WL217	28/06/16	1	WL
WL220	03/06/16	1	WL
	17/01/17	2	WL
	06/02/17	1	WL
WL221	19/07/16	1	SWL
	04/01/17	2	WL
WL230	26/09/16	5	WL
	26/09/16	6	SWL
WL232	20/06/16	4	SWL
	06/07/16	3	SWL
	25/08/16	4	SWL
WL234	18/05/16	1	WL
	23/01/17	2	NWL
WL235	06/09/16	4	SWL
WL241	20/06/16	4	SWL
WL243	18/05/16	5	SWL
	07/06/16	4	WL
	20/06/16	5	SWL
	06/07/16	4	SWL
WL246	26/09/16	2	WL
WL250	14/06/16	2	SWL
	28/06/16	2	WL
WL254	04/01/17	3	WL
WL255	18/05/16	4	WL
WL256	04/05/16	6	WL
	18/05/16	1	WL
	07/06/16	4	WL
WL258	17/01/17	2	WL
WL259	20/04/16	2	SWL
WL260	14/04/16	1	WL
	26/09/16	3	WL
	09/11/16	3	WL
	09/12/16	1	SWL
WL264	20/06/16	4	SWL
	28/06/16	1	WL
WL265	20/06/16	4	SWL
	31/10/16	1	NWL
WL267	28/06/16	1	WL

DOLPHIN ID	DATE	STG#	AREA
WL268	03/01/17	2	WL
WL269	***04/01/17***	***3***	***WL***
WL270	***26/09/16***	***3***	***WL***
WL271	***06/04/16***	***1***	***WL***
	26/04/16	***2***	***WL***
WL272	***04/01/17***	***4***	***WL***
	17/01/17	***4***	***WL***
WL273	***26/04/16***	***3***	***WL***
	14/10/16	***2***	***WL***
	25/11/16	***1***	***WL***
WL274	***04/01/17***	***2***	***WL***
WL275	***04/05/16***	***2***	***WL***
	18/05/16	***4***	***WL***
	25/10/16	***1***	***NWL***

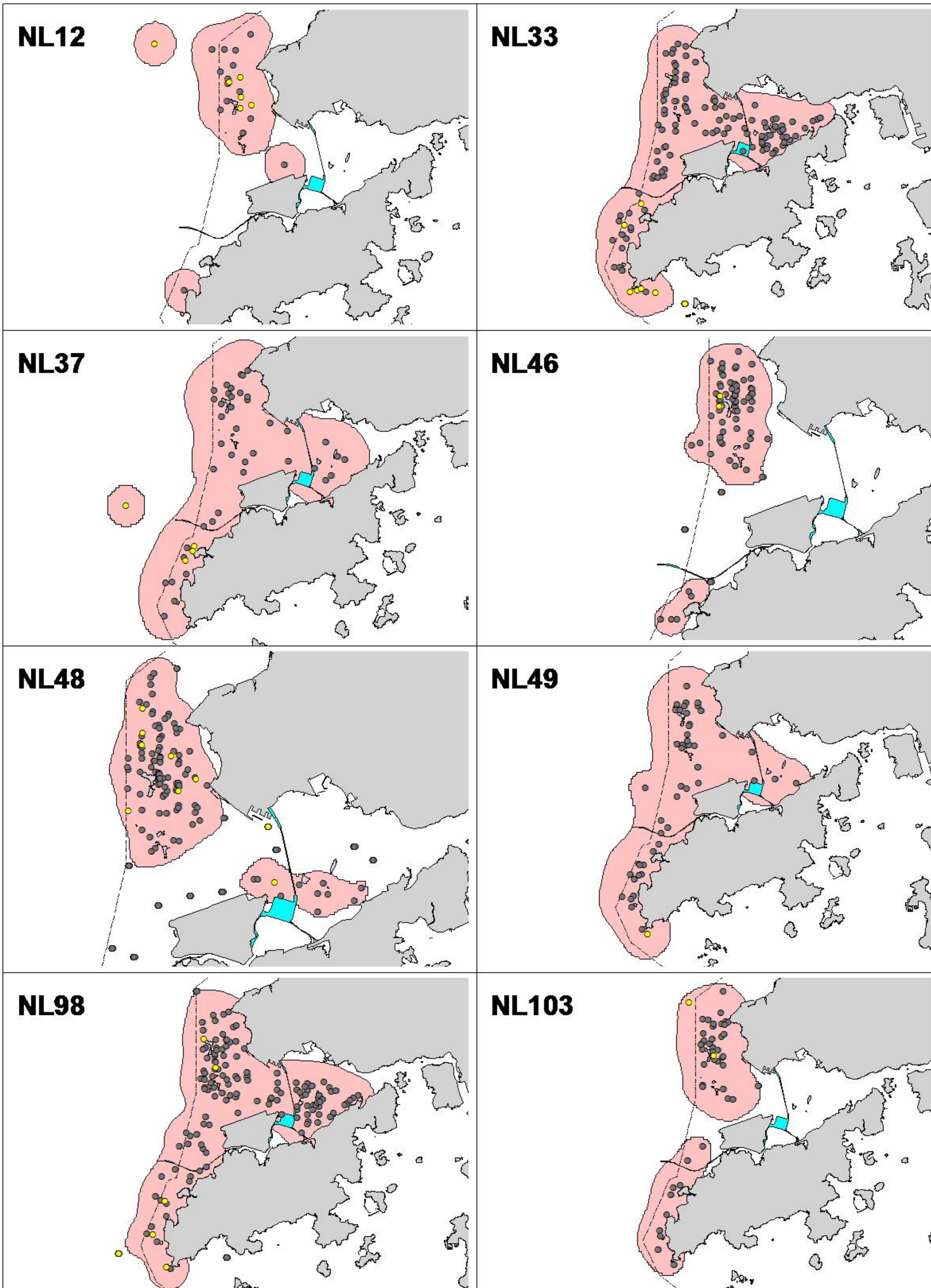
Appendix V. Finless Porpoise Land-based Theodolite Tracking Database (April 2014 - March 2017)

Date	Station	Start Time	End Time	Duration	Beaufort	Visibility	Number of Porpoise Groups	Total No. of Fixes	No. of fix (porpoise)	No. of fix (fishing boat)	No. of fix (other vessels)
22/04/14	Shek Kwu Chau	10:13	15:15	5:02	2	3-3.5	3	166	27	13	46
16/05/14	Shek Kwu Chau	10:19	11:53	1:34	2-3	2	0	26	0	12	13
16/01/15	Shek Kwu Chau	10:08	15:51	5:43	2	2	4	87	21	29	34
18/03/15	Shek Kwu Chau	10:13	15:46	5:33	2	1.5-3	6	246	117	8	119
28/04/15	Shek Kwu Chau	10:07	15:47	5:40	1-2	2.5	3	47	10	4	31
24/12/15	Shek Kwu Chau	10:12	15:46	5:34	2	2-2.5	1	69	4	36	28
26/02/16	Shek Kwu Chau	10:04	15:19	5:15	2	2-3	9	86	72	6	7
18/03/16	Shek Kwu Chau	10:17	15:22	5:05	2	3-4	6	111	81	9	18
28/04/16	Shek Kwu Chau	10:15	15:27	5:12	2	2	2	34	11	9	13
24/05/16	Shek Kwu Chau	10:21	15:39	5:18	2	2.5	4	47	23	0	23
16/11/16	Shek Kwu Chau	10:09	15:40	5:31	3-4	3	1	55	2	14	38
09/12/16	Shek Kwu Chau	10:04	14:26	4:22	2-3	2	0	93	0	66	26
20/12/16	Shek Kwu Chau	10:23	15:38	5:15	2-4	2.5	1	87	4	43	38
26/01/17	Shek Kwu Chau	10:16	15:48	5:32	2-4	2	1	33	9	11	12
17/02/17	Shek Kwu Chau	10:25	15:41	5:16	2	1.5-2	7	149	86	40	21
10/03/17	Shek Kwu Chau	10:08	15:33	5:25	2	3	2	162	22	107	31
20/03/17	Shek Kwu Chau	10:03	15:41	5:38	1-3	1.5	7	234	132	63	38
30/03/17	Shek Kwu Chau	10:09	15:34	5:25	2-3	2.5	5	87	44	35	7

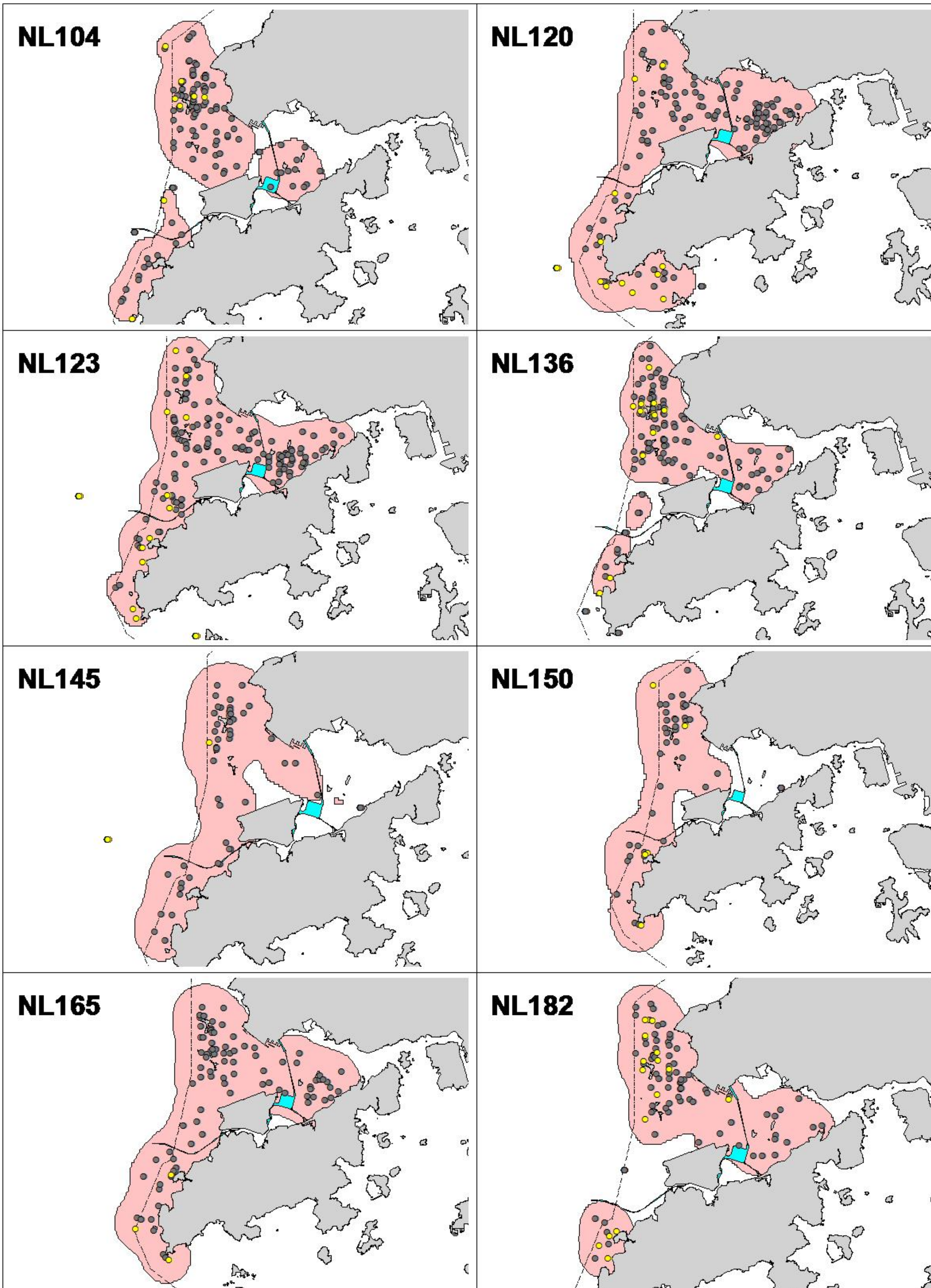
Appendix VI. Ranging patterns (95% kernel ranges) of 153 individual dolphins with 10+ re-sightings that were sighted during 2016 (note: yellow dots indicates sightings made in 2016)



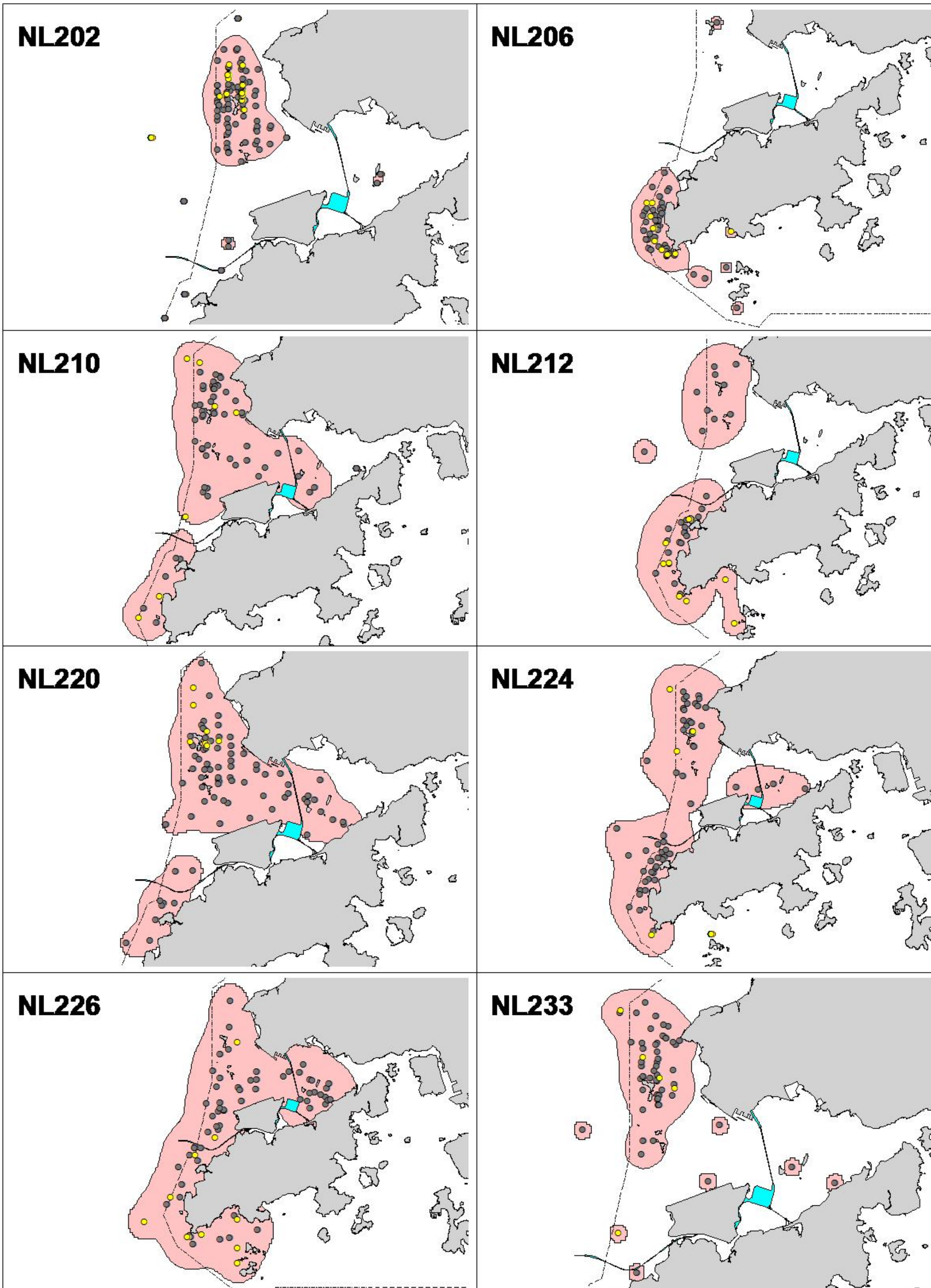
Appendix VI. (cont'd).



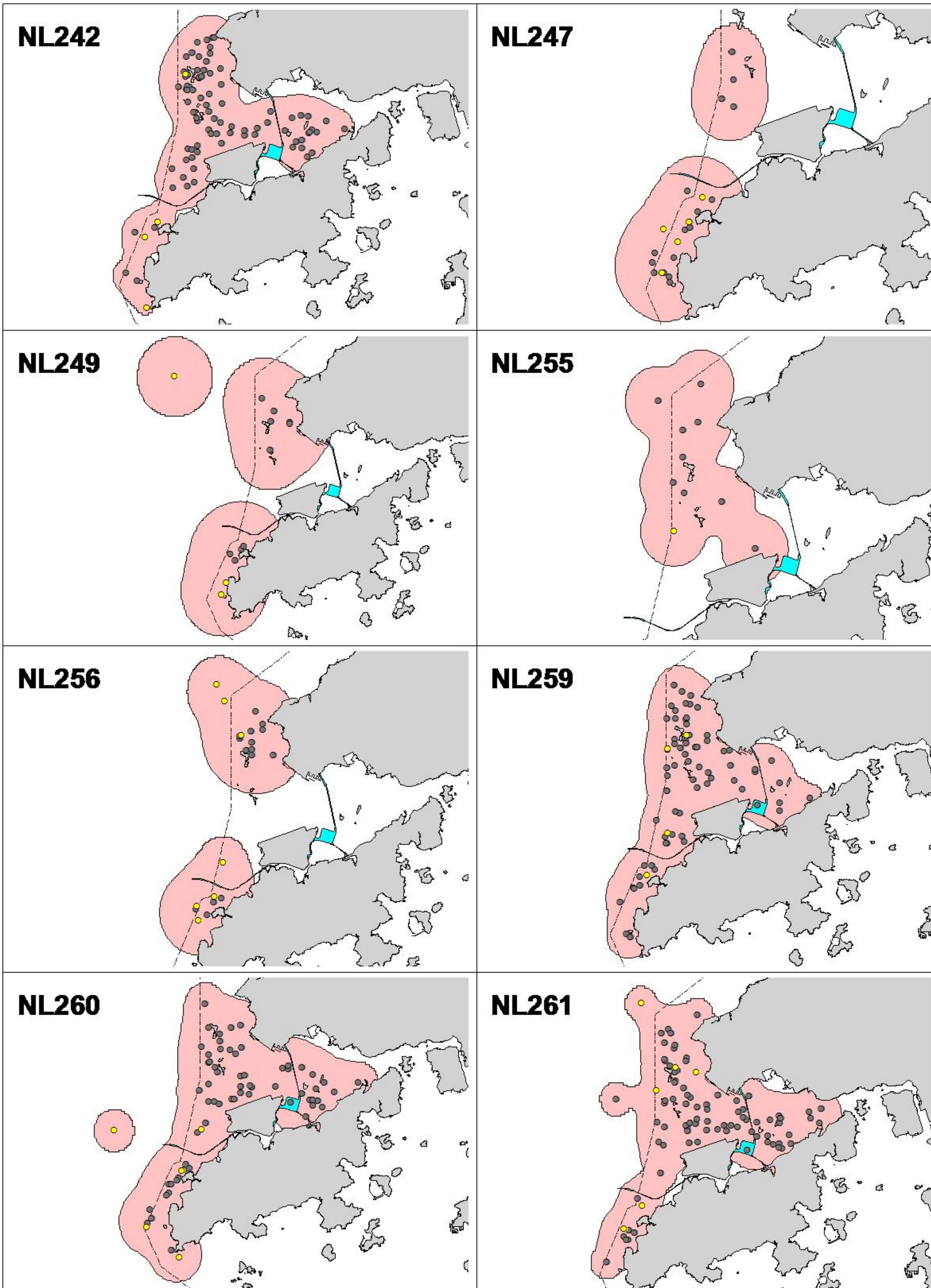
Appendix VI. (cont'd).



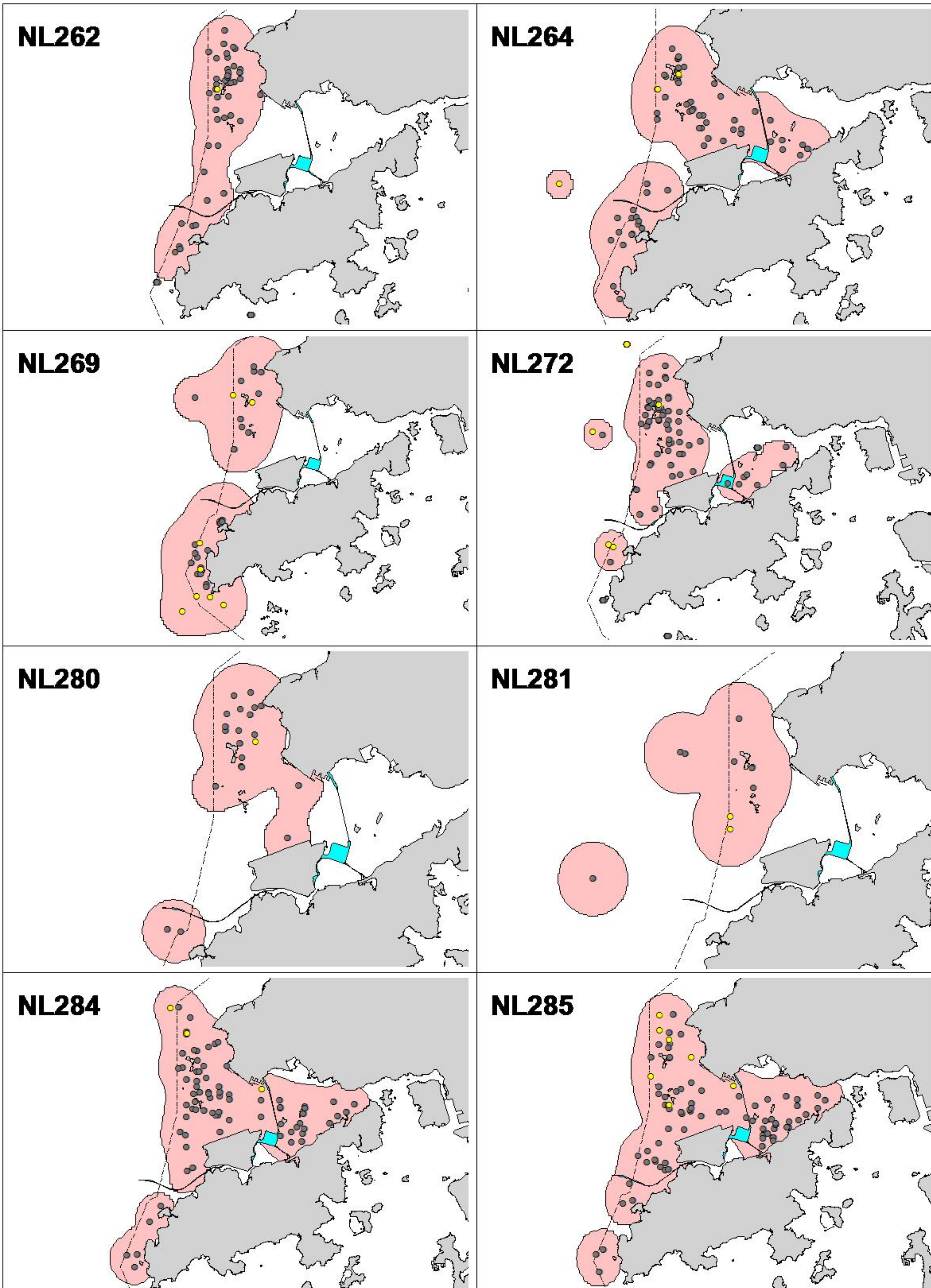
Appendix VI. (cont'd).



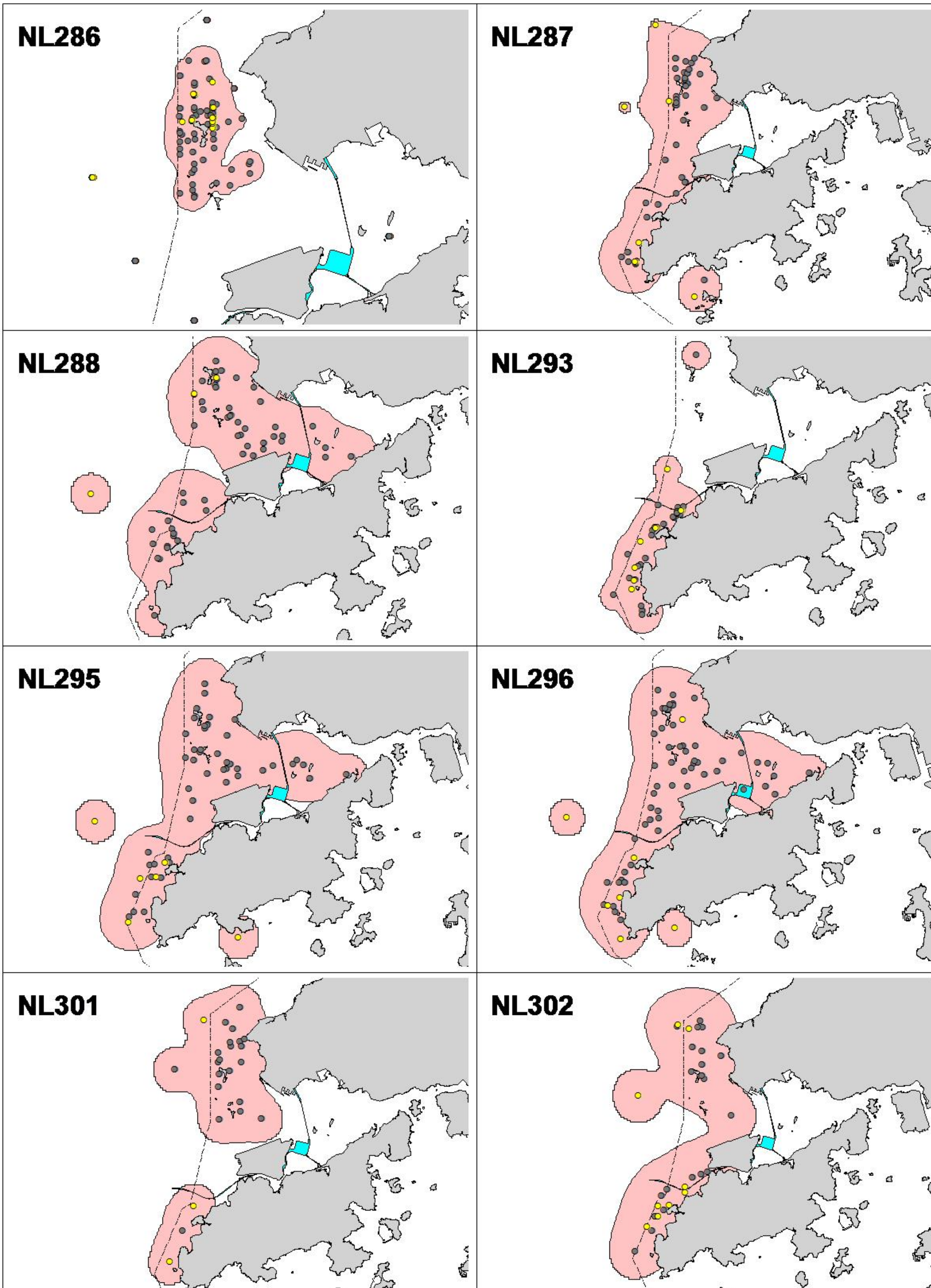
Appendix VI. (cont'd).



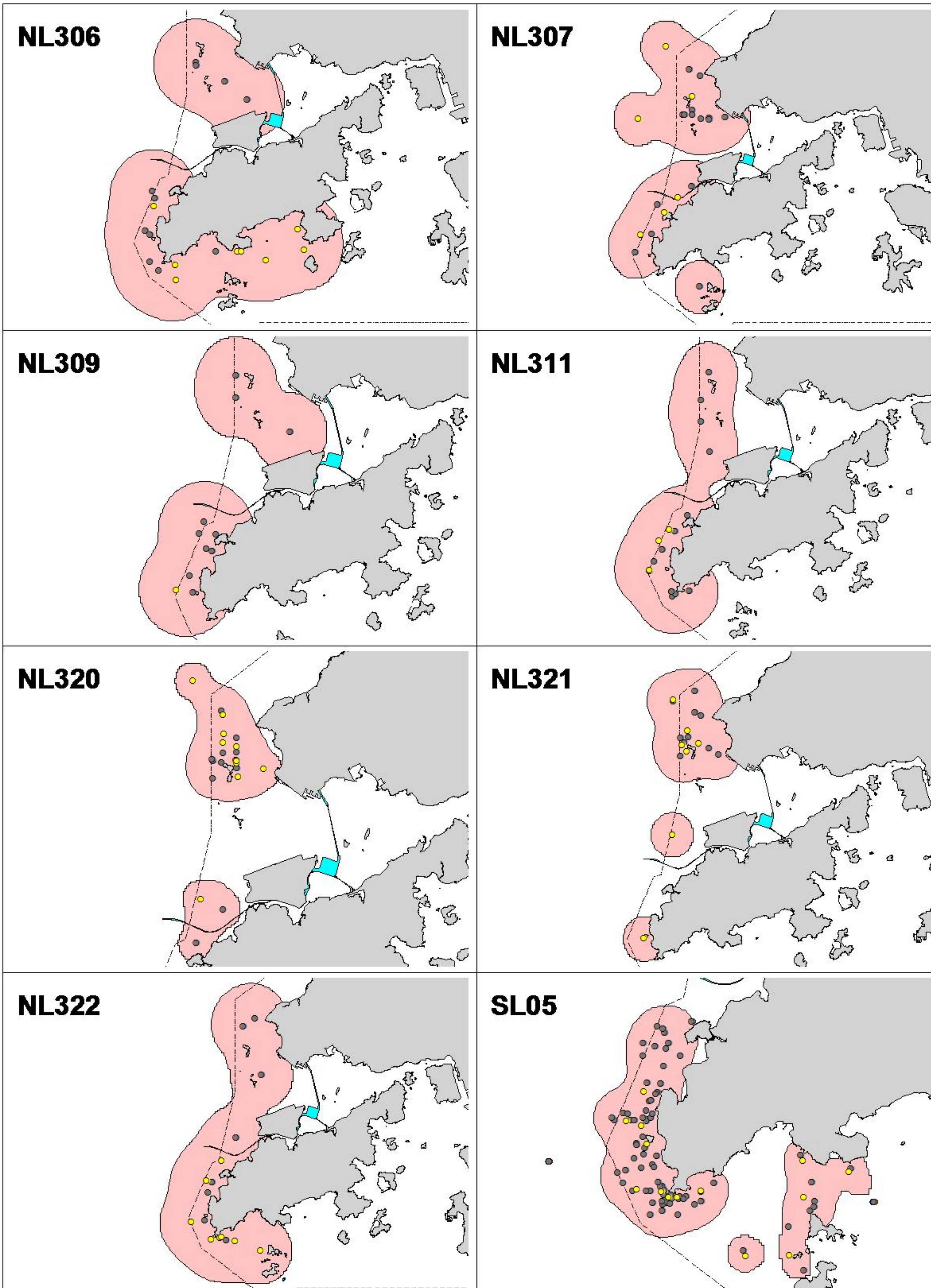
Appendix VI. (cont'd).



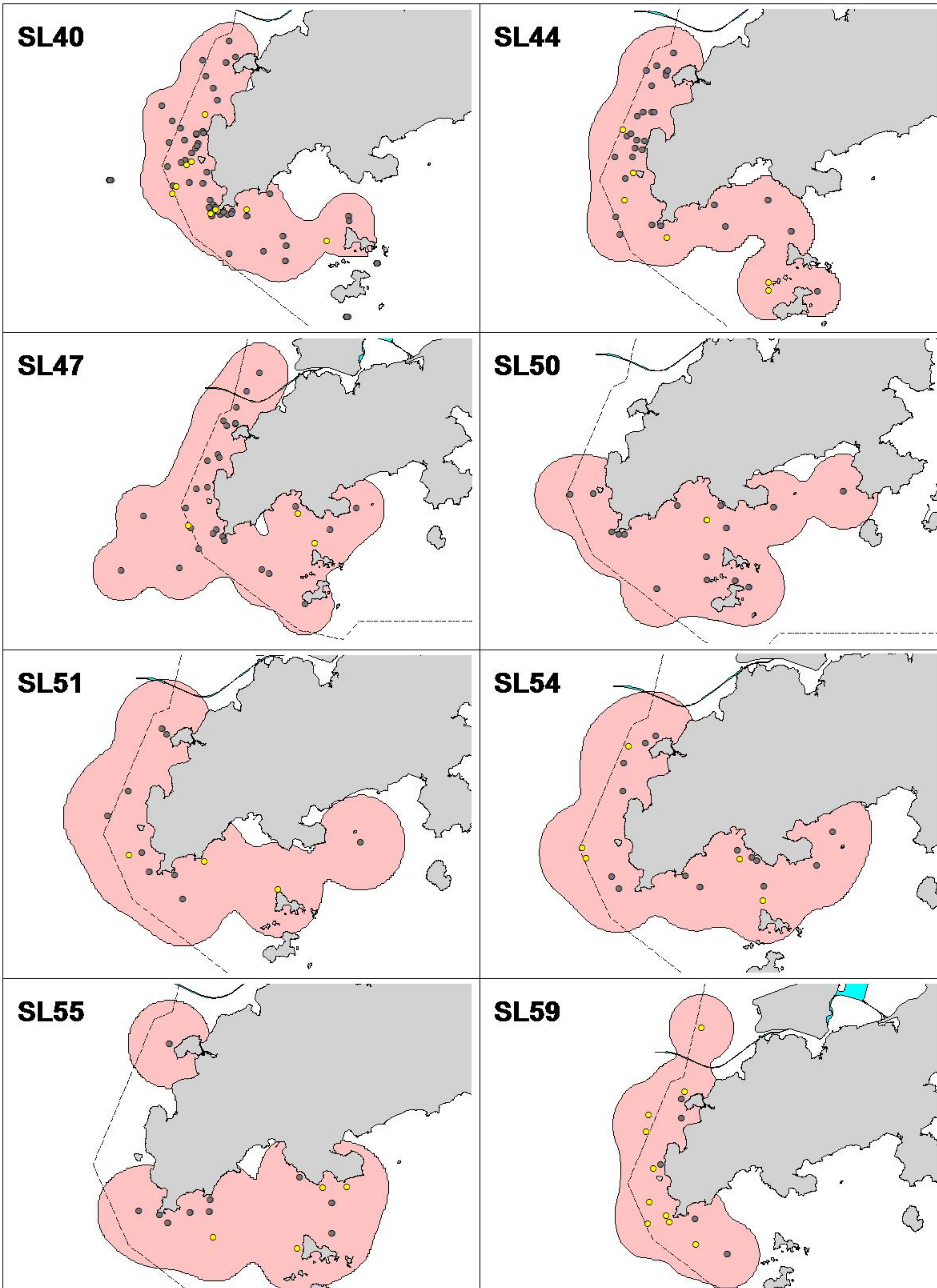
Appendix VI. (cont'd).



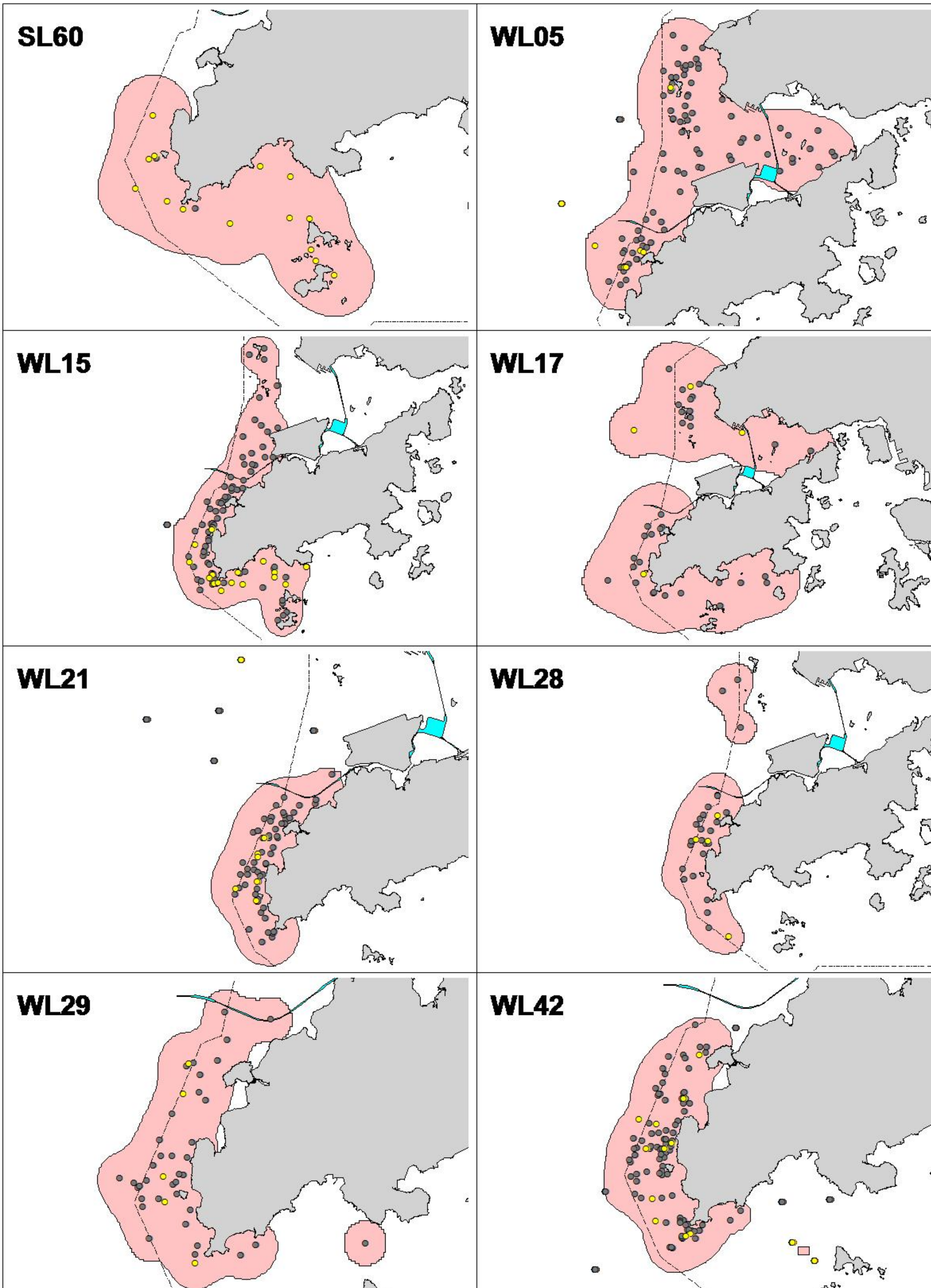
Appendix VI. (cont'd).



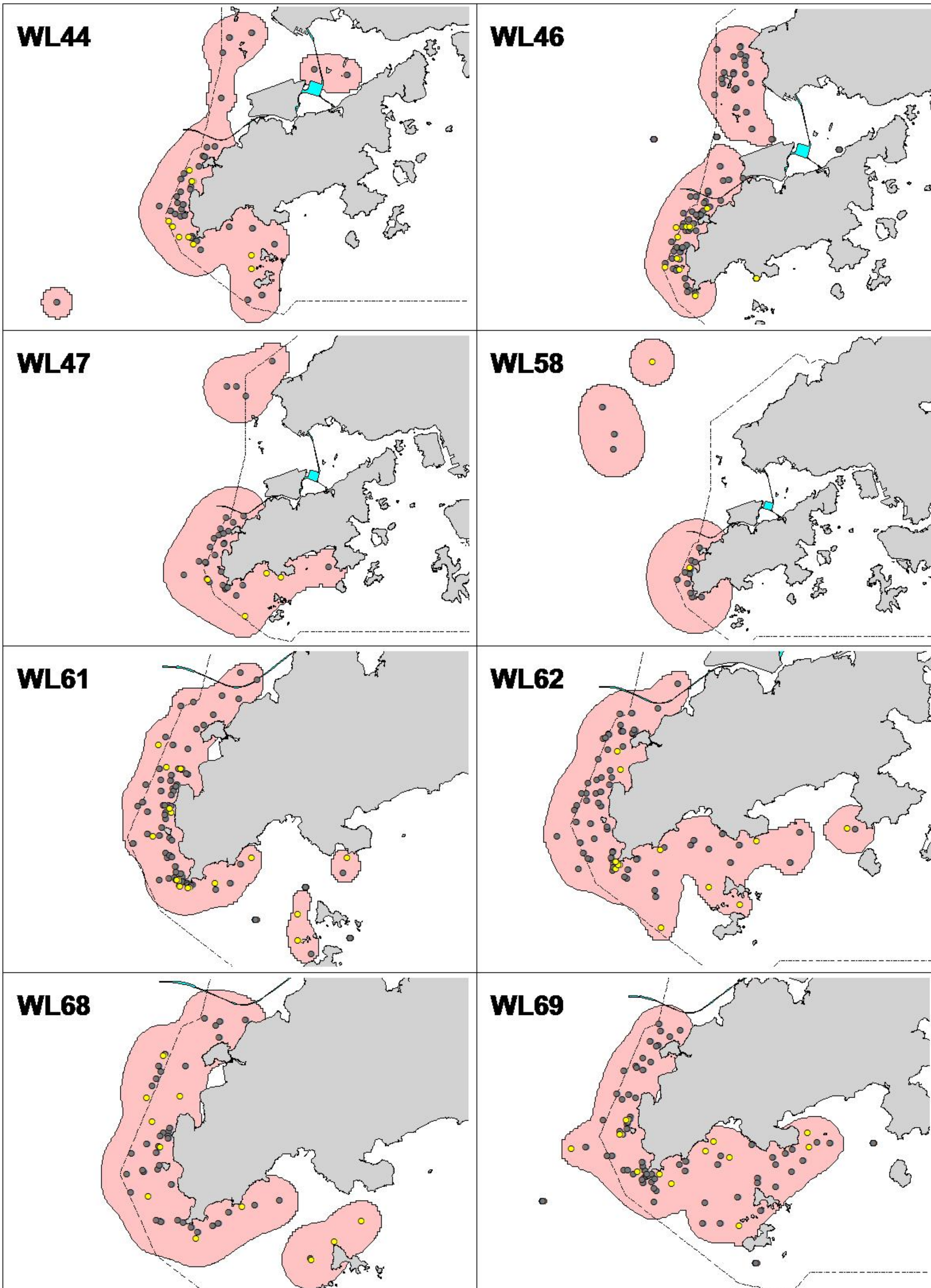
Appendix VI. (cont'd).



Appendix VI. (cont'd).



Appendix VI. (cont'd).



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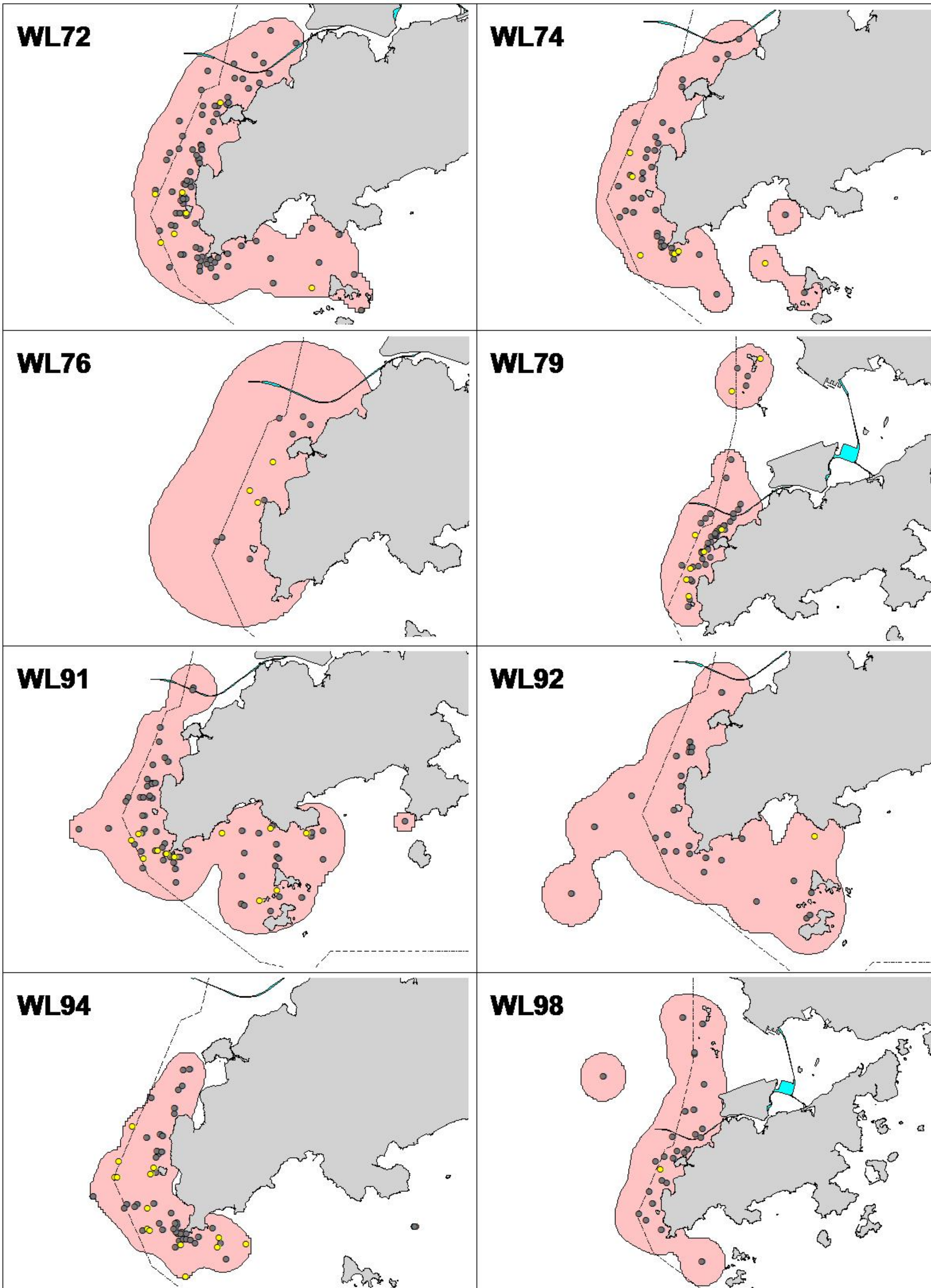
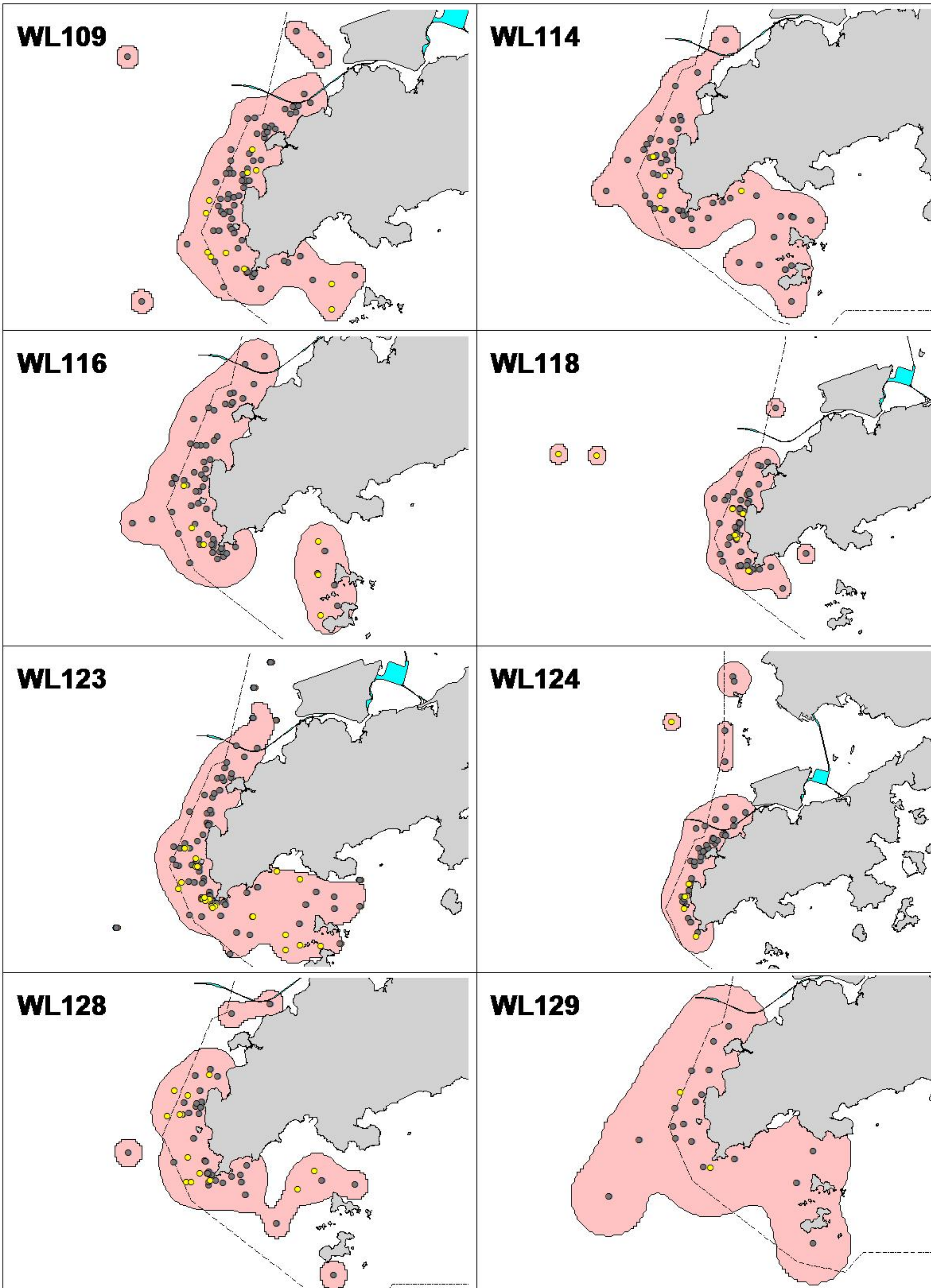


Appendix VI. (cont'd).



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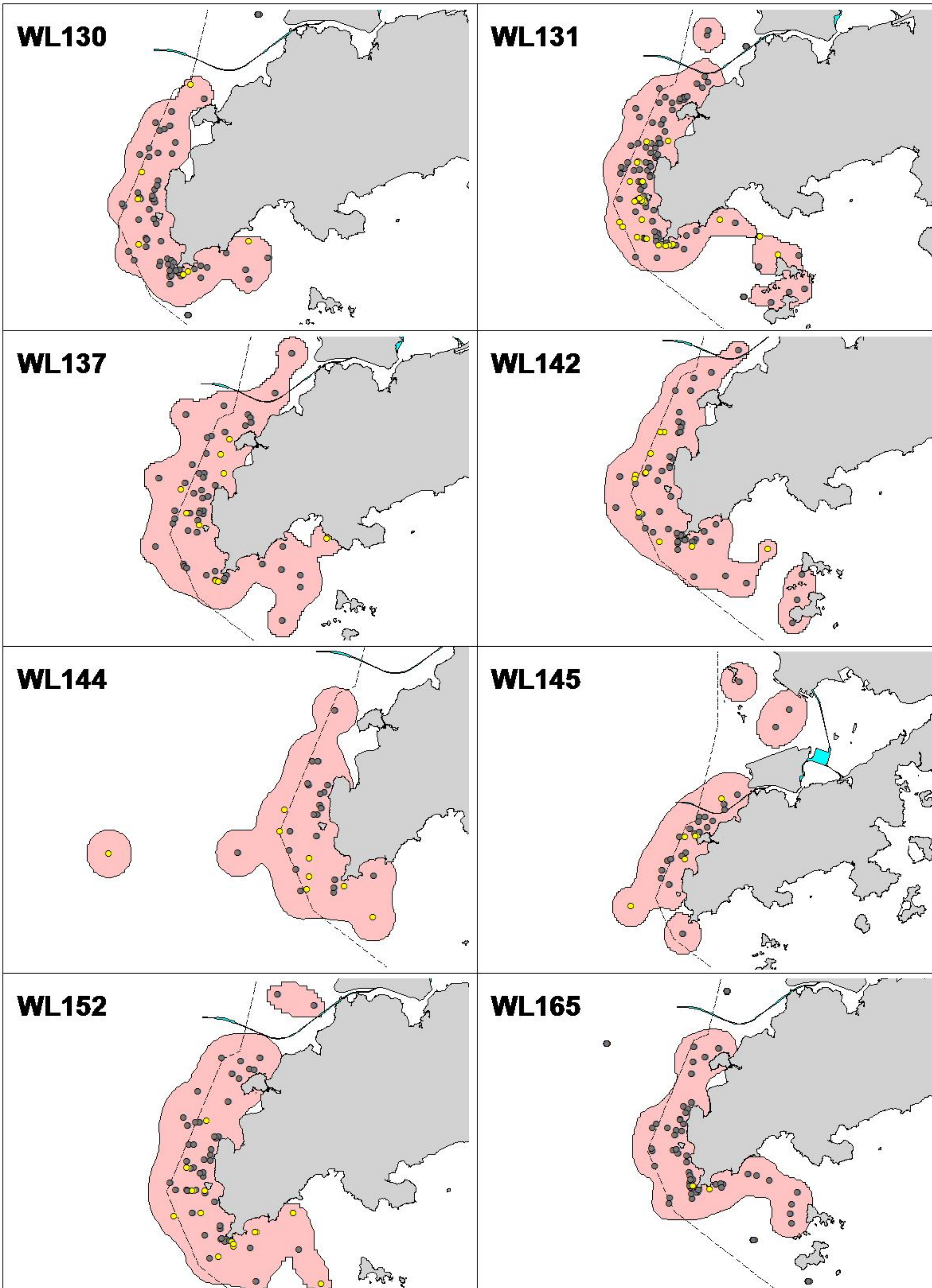
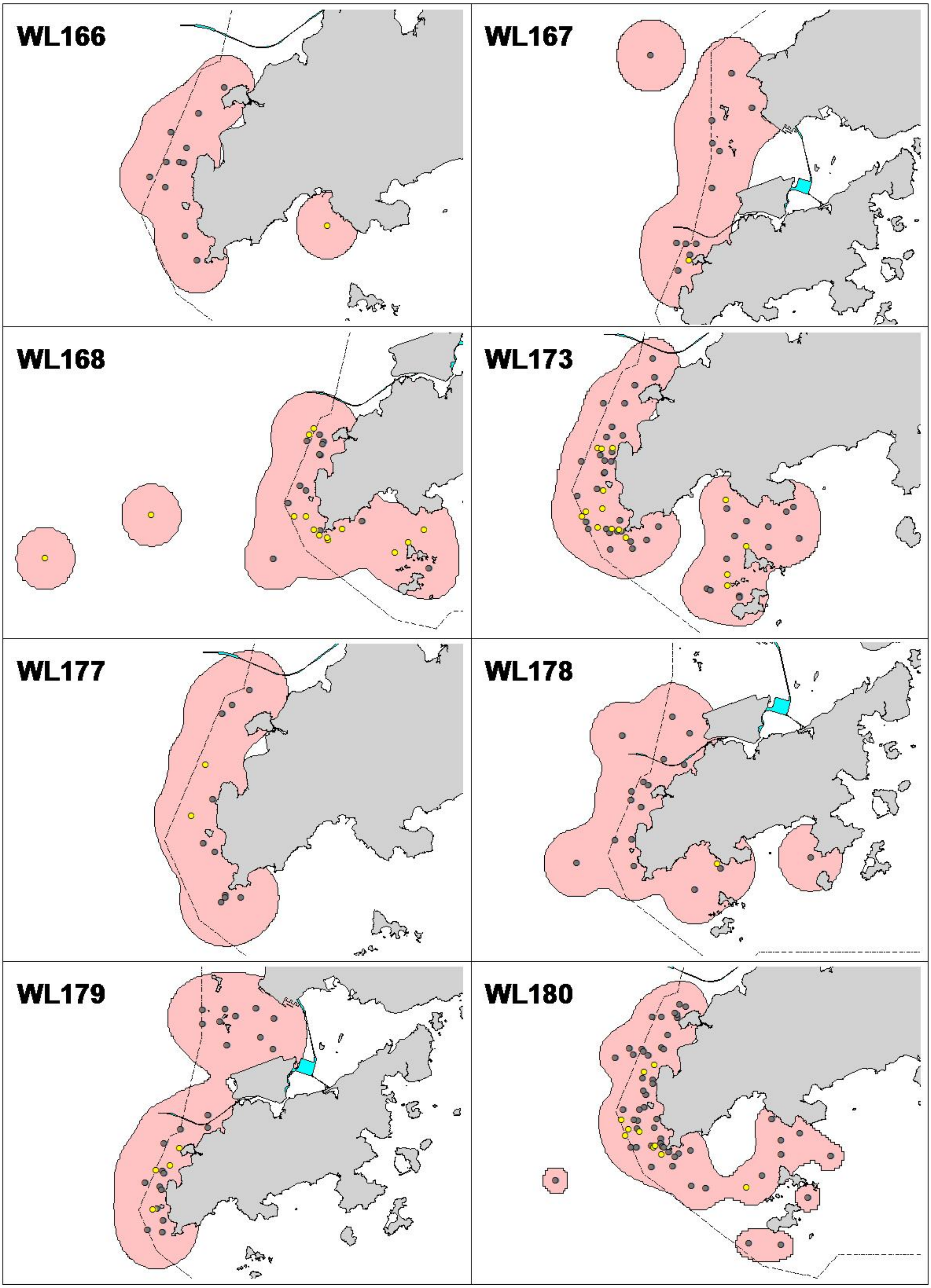
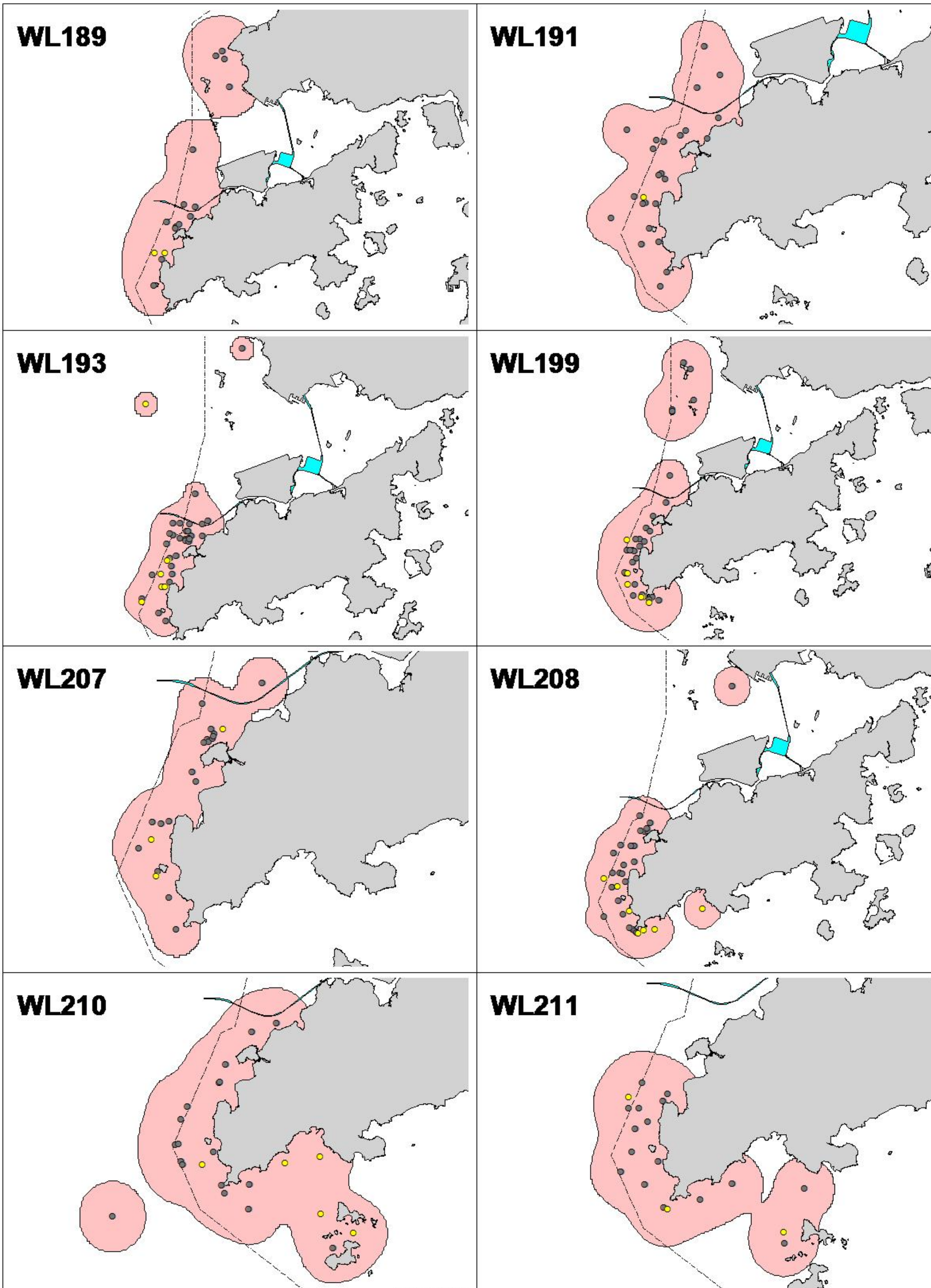


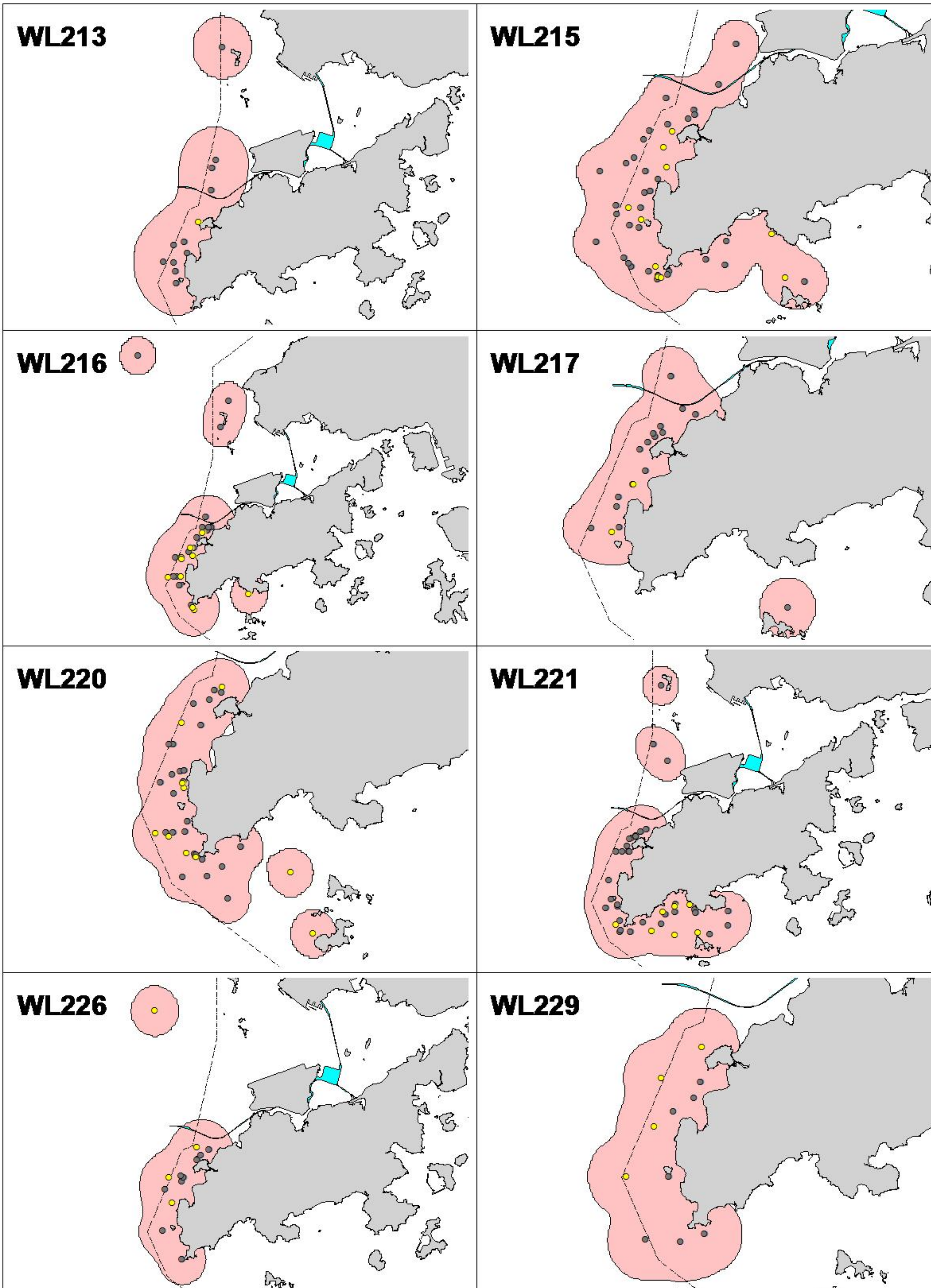
Appendix VI. (cont'd).



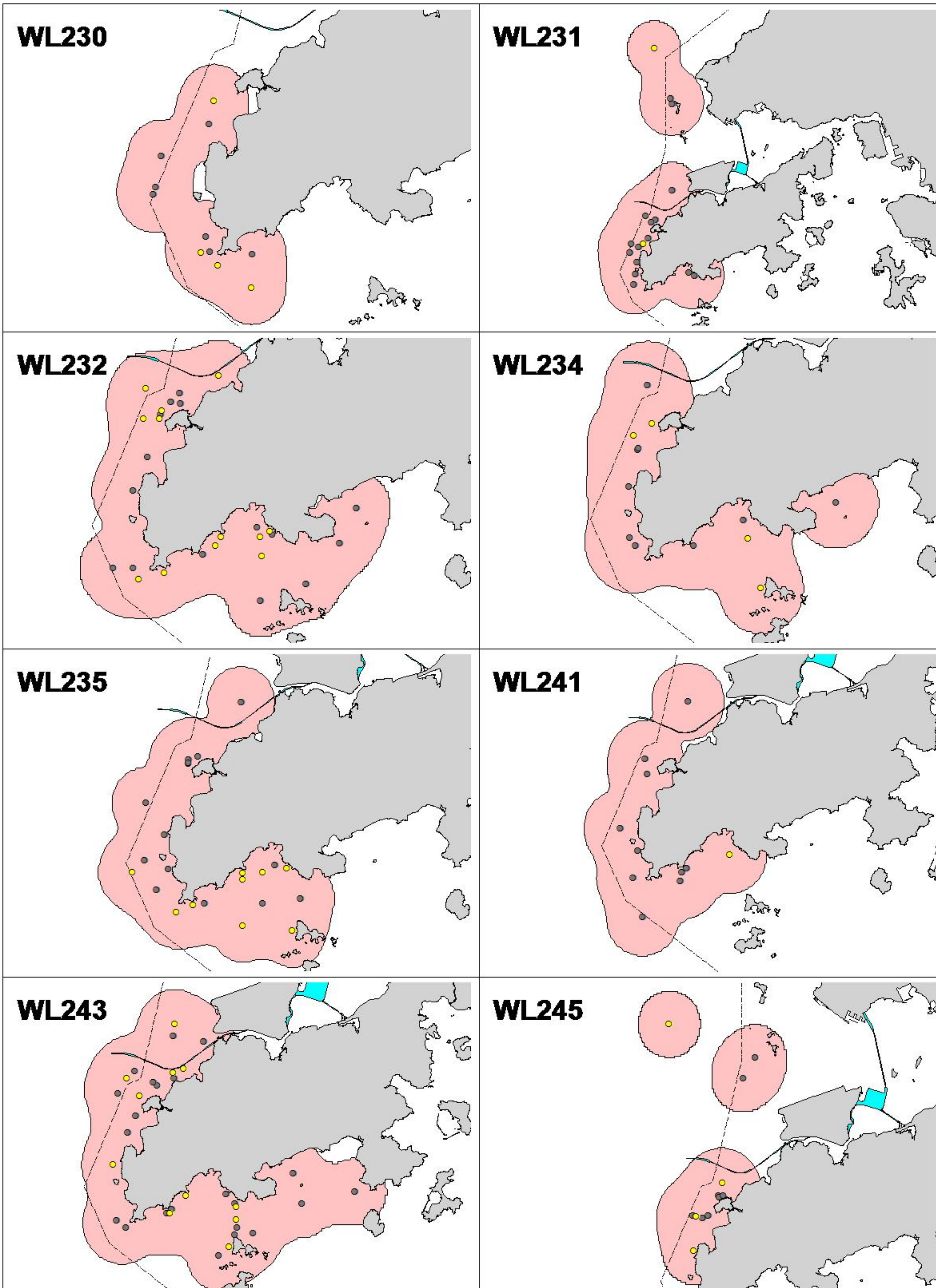
Appendix VI. (cont'd).



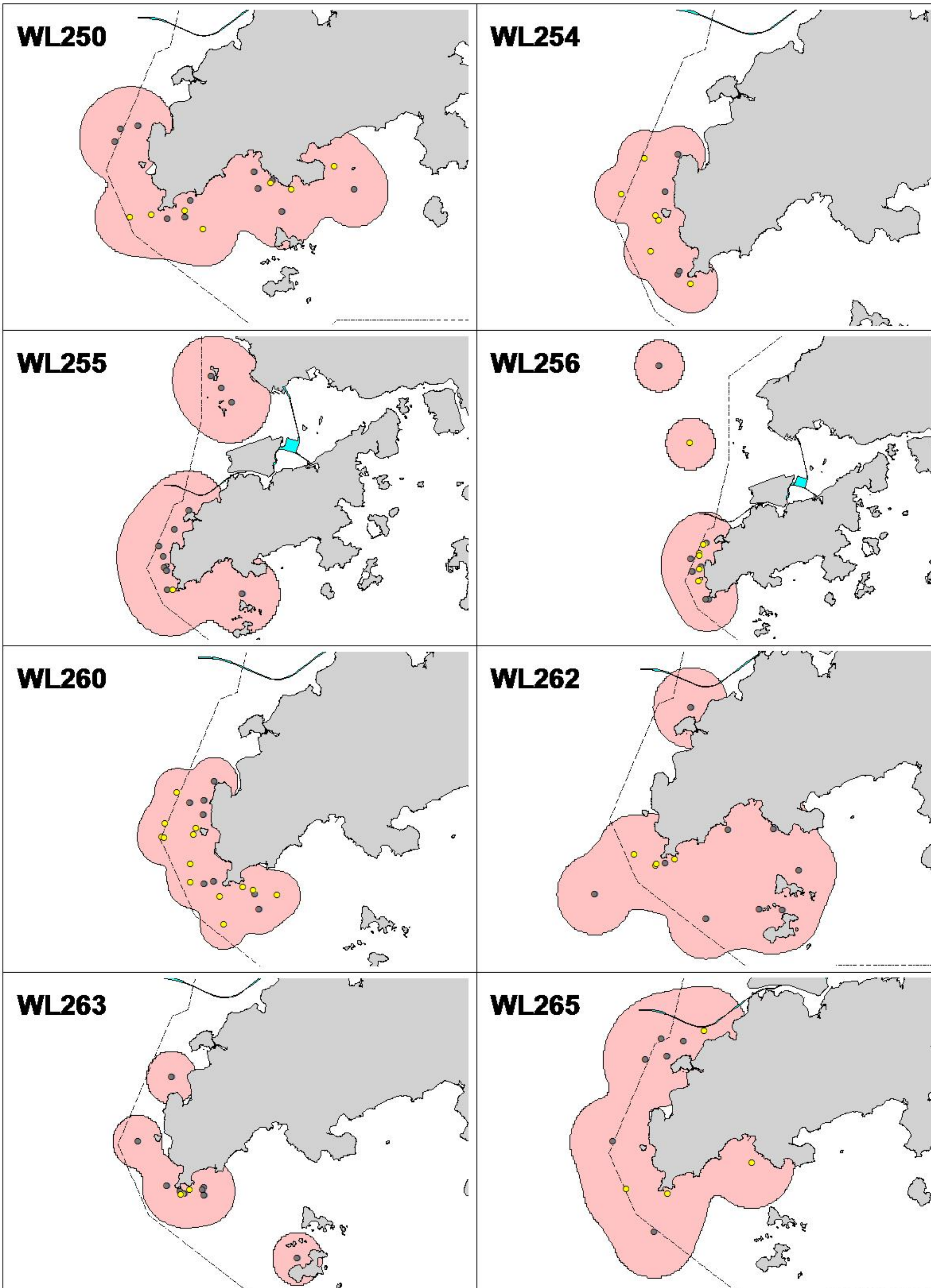
Appendix VI. (cont'd).



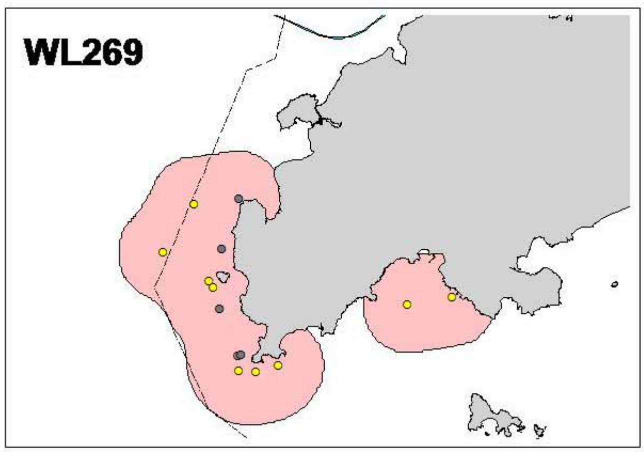
Appendix VI. (cont'd).



Appendix VI. (cont'd).



Appendix VI. (cont'd).



Monitoring of Marine Mammals in Hong Kong Waters (2016-17)

Final Report

(1 April 2016 to 31 March 2017)

Responses to Comments

Comments Received	Date Received
Comments from Marine Department (MD)	7 June 2017
Airport Authority Hong Kong (AAHK)	12 June 2017
Civil Engineering and Development Department (CEDD)	12 June 2017

Monitoring of Marine Mammals in Hong Kong Waters (2016-17)

Final Report

(1 April 2016 to 31 March 2017)

Responses to Comments

Comments	**Responses**
Comments from MD dated 7 June 2017	
1. Executive Summary & Paragraph 5.8	
For Executive Summary & Paragraph 5.8, I should be grateful if you would clarify whether the design of the proposed **large marine protected area** connecting among *the Sha Chau and Lung Kwu Chau Marine Park, the soon-to-be established Southwest Lantau Marine Park as well as the Soko Islands Marine Park* was only based on limited figures and findings of dolphins' distribution under the study. If so, it would be premature, at this stage, to recommend on extending/connecting the marine protection areas. Anyhow, the proposal will definitely affect the marine traffic or current port operation in and to/from Pearl River Delta. Thus, the trade should have the right to know and be consulted for the proposal and its relevant impact with corresponding measures.	The proposal of a large marine protected area connecting the existing and soon-to-be established marine parks was not based on limited figures and findings under the present study. In fact, in the past and present monitoring reports (see Hung 2015, 2016), the waters between these marine parks have been repeatedly highlighted as critical dolphin habitats for foraging and traveling activities. The waters between Soko Islands Marine Park and Southwest Lantau Marine Park was once used by dolphins in the past, but as the high-speed ferries number has increased significantly in the past decade, the usage of such waters and hence their traveling to Soko Islands has been diminished (see Hung 2012). The adverse impact of high-speed ferries on dolphin habitat use has been well documented in past literature (e.g. Hung 2008; Hung 2012; Sims et al. 2012; Marcotte et al. 2016). So the large marine protected area proposed in the report by the author is well justified by a wealth of past scientific studies.
2. Executive Summary & Paragraph 5.8	
In addition, in order to provide an assessment of the marine impact arising from the proposal, a marine traffic impact assessment (MTIA) should be conducted at a suitable juncture.	The idea of the large protected area is conceptual at this stage as it is just a way-forward conservation strategy proposed by the author in light of the dramatic decline in dolphin numbers in HK. If the idea is to be considered further, certainly a thorough assessment including a MTIA would be needed to explore the feasibility of such proposal and the trade would be properly consulted. Relevant sections of the report have been revised accordingly.

Monitoring of Marine Mammals in Hong Kong Waters (2016-17)

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(1 April 2016 to 31 March 2017)

Responses to Comments

Comments	**Responses**
Comments from AAHK dated 12 June 2017	
1. Executive Summary (English), Para. 4	
Give the combined estimate for "WL, NWL and NEL" and "SWL" and compare with the last 5 years to show the decline trend? (trends in past 5 years were reported in 2015-2016 report)	For a better overview of dolphin abundance, only the combined estimates for the four survey areas are presented in the Executive Summary in the 2016-17 report. Detailed abundance and trend of specific survey areas are available in the main text.
2. Executive Summary (Chinese), Para. 5	
"並在過去十五年出現的比率持續下降，" This has not been mentioned in the English version above.	The English equivalent of the Chinese sentence "並在過去十五年出現的比率持續下降，" has been added in the English version.
3. Executive Summary (Chinese), last para.	
"海豚保育區" "Marine protected area" in English version, not "marine mammal or dolphin protected area" as stated in the Chinese here.	"海豚保育區" has been amended as "海洋保護區" in the Chinese version.
4. Section 5.2.2, 2nd para.	
Did not mention the seasonal pattern of FP around PT, NP and SK areas? They were only recorded there in summer / autumn months.	As surveys are only allocated in PT, NP and KS areas in summer/autumn months, the seasonal pattern of FP cannot be assessed with the lack of distribution data in winter and spring months.
5. Section 5.4.2, 2nd para.	
"… one UC and 20 UJs sighted for the entire	The second set of figures (one UC and 20 UJs)

Comments	Responses
year (Figure 23).” No UC and 17 UJ were recorded as mentioned in the previous paragraph?	was for the calendar year of 2016, while the first set of figures (no UC and 17 UJ) was for the 2016-17 period.
6. Section 5.4.3, 3rd para.	
“The two sightings engaged in traveling activities…” Do these two sightings belong to the same group? It mentioned that there was one group engaged in traveling activity in the 1st paragraph of S.5.4.3	The second set of figures (two sightings engaged in traveling activities) was for calendar year of 2016, while the first set of figures (one group engaged in traveling activity) was for the 2016-17 period.
7. Section 5.4., 2nd para. (Figure 31)	
What about the one group of a single trawler as mentioned in the previous paragraph? It is not shown in Figure 31.	Again, it is due to the difference in figures between the 2016-17 period and calendar year of 2016.

Monitoring of Marine Mammals in Hong Kong Waters (2016-17)

Final Report

(1 April 2016 to 31 March 2017)

Responses to Comments

Comments	Responses
Comments from CEDD dated 12 June 2017	
1. Executive Summary	
Referring to the Executive Summary of the draft report, it is noted that the following para. in Chinese and English is inconsistent. The term "these issues" may be a little bit ambiguous. Please amend if appropriate. ""Evidently, the changes in dolphins' distribution, habitat use, abundance and individual range use in recent years are the consequences stemmed from the combination of existing threats and additional threats from coastal development. **To address these issues,** there should be a more stringent control on reclamation around Lantau waters, a proper management of high speed ferries, and the establishment of a large marine protected area connecting the Sha Chau and Lung Kwu Chau Marine Park with the proposed Southwest Lantau Marine Park and the Soko Islands Marine Park." "各項證據顯示，在香港生活的中華白海豚，無論在其分佈、棲息地使用、數量及個體活動範圍使用於近年所呈現的種種變化，均與牠們每天面對的一些長久存在的威脅、及近期一些與沿岸發展有關的額外威脅有密切的關係。**為達致中華白海豚繼續使用香港水域的目標**，有關部門應更嚴謹地管制在大嶼山水域的填海工程；妥善管理高速船隻的交通量；並儘快在大嶼山西面水域設立一大型海豚保育區，將現有的沙洲及龍鼓洲海岸公園、擬建中的西南大嶼山海岸公園及索罟群島海岸公園連接起來。"	In the Chinese version of Executive summary, "為達致中華白海豚繼續使用香港水域的目標，" has been amended as "為應對這些威脅，"

Monitoring of Marine Mammals in Hong Kong Waters (2016-17)

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(1 April 2016 to 31 March 2017)

Responses to Further Comments

Further Comments Received	Date Received
Further Comments from Marine Department (MD)	21 June 2017

Monitoring of Marine Mammals in Hong Kong Waters (2016-17)

Final Report

(1 April 2016 to 31 March 2017)

Responses to Further Comments

Comments	Responses
Further Comments from MD dated 21 June 2017	
1.	
Regarding the subject report, our comments are as below: ● According to the explanation from the report which is reproduced below, one of the objectives is *to identify individual Chinese White Dolphins by their natural markings using photo-identification technique. This objective was achieved by taking high-quality photographic records of Chinese White Dolphins for photo-identification analysis. Photographs of re-sighted and newly identified individuals were compiled and added to the current photo-ID catalogue, with associated descriptions for each newly identified individual. Photographic records of finless porpoises were also taken during vessel and helicopter surveys for educational purposes.* As such, please consider adding the photos record and results in the report for inspection. In addition, the figures and findings of dolphins' distribution under the study are from sightings and can not scientifically draw inference on the whole population of dolphins within the study areas. Thus, you may wish to further explore ways to evaluate with the actual situation of the dolphins' distribution and the most practical solution.	The photo-identification records involve thousands of high-resolution pictures and hence cannot be appended to the final report. AFCD will explore ways to share the photo-id data with other researchers working on the same Pearl River Estuary CWD population. Both the number of sightings and the sighting history of each identified CWD individuals are important pieces of information to help shed light on the status of the CWD using Hong Kong waters. Since AFCD's monitoring has been taking all these factors into account, the findings obtained and the conclusions so drawn should be regarded as scientifically valid.
2. RtC and the revised Executive Summary	
● I trust that the Executive Summary is mainly based on the report, and the report has problem as stated above and is not convincing enough to make any concrete	The alleged flaw of the report is unfounded as explained above. As clarified in the response to your previous

Comments	Responses
recommendations. Thus, we have reservations on the recommendation, of Executive Summary, of extending/connecting the marine protection areas connecting among *the Sha Chau and Lung Kwu Chau Marine Park, the soon-to-be established Southwest Lantau Marine Park as well as the Soko Islands Marine Park*. Moreover, the proposal will definitely affect the marine traffic or current port operation in and to/from Pearl River Delta. Hence, the trade should have the right to know and be consulted for the proposal and its relevant impact with corresponding measures at a suitable juncture.	comment, if the idea of the marine protected area is to be considered further, a thorough assessment including a MTIA would be conducted to explore the feasibility of such proposal and the trade would be properly consulted. The last sentence of the Executive Summary has been slightly amended to reflect this point, as follows: *"To address these issues, there should be a more stringent control on reclamation around Lantau waters, a proper management of high speed ferries, and the establishment of a large marine protected area connecting the Sha Chau and Lung Kwu Chau Marine Park with the proposed Southwest Lantau Marine Park and the Soko Islands Marine Park, subject to further study."*
● For RtC, your responses on Paragraph 5.8 *"...a thorough assessment including a Marine Traffic Impact Assessment (MTIA) would be needed to explore the feasibility of "such" proposal; and the trade would be properly consulted..."* has reflected our view and should be properly documented in the report.	All the comments received from MMCWG members and the responses would be documented in the final report as a separate Appendix.